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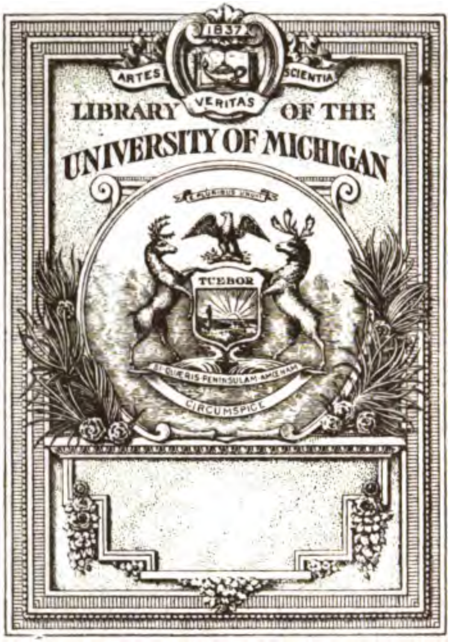

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LONDON JOURNAL

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CONDUCTED BY

MR. W. NEWTON,

OF THE OFFICE FOR PATENTS, CHANCERY LANE.

(Assisted by several Scientific Gentlemen.)

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[CONJOINED SERIES.]

I. Petrie's Improvements in Steam-engines.
II. Cowen's Machinery for Making Retorts; Robinson's Gas-engine; Kurtz's Furnace for Drying and Evaporating; and Johnson's Improvements in Machinery for Preparing Cotton, &c.
III. Heimann's Machinery for Making Wire-ropes; Wilson's Mode of Cutting Envelopes; Craig, and Jarvie's Improvements in Spinning Hemp; and Wilson's Improvements in Fire-places.
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V. Higham and Bellhouse's Apparatus for Evaporating; Bedington's Improvements in Furnaces; Worby's Brick and Tile Machine; Bencraft's Improvements in Harness; Petit's Glove Fastening; and Shaw's Improvements in Discharging Fire-arms.
VI. Harbottle's Machinery for Rivetting Leather; Elliott's Improvements in Making Buttons; and Chatten's Improved Dead-eyes for Ships.
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VIII. Hays' Apparatus for Regulating the Speed of Ships' Propellers.
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XIII. Cooper's Machinery for Doubling Fibrous Materials; Groom's Improved Flyer; Newton's Machinery for Making Zinc Wire; Aitken's Improvements in Atmospheric Propulsion; and Squire's Tanning Apparatus.
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XVI. Fuller's Machinery for Turning and Boring Metals.
XVII. Harrison's Improvements in Spinning; Gamble's Apparatus for Making Sulphuric Acid; Lacy and Buck's Railway Sleepers; and Weiger's Furnace for Alloying Metals.
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CONJOINED SERIES.

No. CLVIII.

RECENT PATENTS.

To James Petrie, *of Rochdale, in the county of Lancaster, engineer, for an invention of certain improvements in steam-engines.*—[Sealed 22nd May, 1844.]

These improvements in steam-engines relate, firstly, to the application of a certain novel arrangement or construction of apparatus or mechanism to ordinary steam-engines, for the purpose of "cutting off" the steam, when working steam-engines expansively; and consist chiefly in the particular application of and mode of working certain sliding valves or "cutting-off" plates, placed in the inside of and worked in connection with the common D- or slide-valves of steam-engines; which said sliding valves or cutting-off plates are worked by means of a moveable cam or tappet, in addition to the ordinary excentric or crank used for working the D-valves. The peculiar advantages to be obtained by the application of the invention are, firstly, cutting off the steam close to the nozzle of the steam cylinder; secondly, the sliding valves or cutting-off plates being at the time of motion nearly in an equilibrium of pressure, but little power is required to work them; thirdly, smoothness and ease of motion, as the parts which require to be suddenly set in motion are very light in their construction; fourthly, the ordinary motion (by excentric) of the D-valves being retained, the improved method of admitting steam into the cylinder may be used, so as to avoid the concussion caused when it is admitted too suddenly. The second feature of novelty consists in a method of connecting the aforesaid cutting-off plates or slides of steam-engines (and their operating apparatus worked in connection with the common D-valves,) with the ordinary governor of the steam-engine, so that the steam may be cut off earlier or later by the action of the governor, as the power required is less or more, which will ensure the maximum of expansion, thereby economizing steam, and consequently fuel, to the utmost extent.

In Plate I., fig. 1, represents the side elevation of the cylinder of an ordinary stationary steam-engine, with its valve-boxes in section; and fig. 2, is a front elevation of a cylinder and the side pipes of an ordinary steam-engine, a portion of the front of the steam-boxes being removed, and the valves shewn in section. The steam cylinder is shewn at A, and the two D- or slide-valves, B, B^1, are worked in the usual manner by means of an excentric or crank, and are similar in form to those of the ordinary construction. The partitions a, a^1, which separate the steam end from the eduction end, are placed near to the eduction side of the bars b, b^1, which traverse across the ports in the facing on the nozzles c, c^1, of the cylinder, so as to make sufficient room for the sliding or cutting-off plates d, d^1; there is also another bar e, e^1, across the face of the valve, at the extremity of the steam end. The space between these bars forms a thoroughfare or sluice f, f^1; these two bars are finished to a plane surface on both sides, viz., on the side which slides on the facing on the cylinder nozzle, and also on the side enclosed by the semicircular part of the D-valve; on the last-mentioned surfaces are the sliding plates d, d^1, before mentioned, by the movement of which the cutting-off of the steam is effected; they are connected together by means of rods g, g^1, passing through stuffing-boxes in the bottom of the upper steam-box, and in the top of the lower steam-box. The sliding plates *d*, *d*¹, are also connected with machinery, hereafter described, in such a manner as to cause them to partake of the motion of, or move along with, the D-valves B, B¹, for any portion of the stroke, and then to move on the inside facing of the D-valve, so as to close either of the openings *f*, *f*¹, and thereby cut off the steam for the remainder of the stroke. When the sliding plate *d*, covers the sluice *f*, in the face of the D-valve B, as in fig. 1, the other sliding plate *d*¹, is in such a position as to leave the sluice *f*¹, in the D-valve B¹, uncovered. The sliding plate *d*¹, being in this position, and the D-valves moving downwards, the sluice *f*¹, is in a condition to admit steam into the bottom port of the cylinder A, which steam will be cut off when the plate *d*¹, closes the sluice *f*¹. When the sluice *f*¹, is thus closed, the sluice *f*, will be opened, and the D-valve B, is then in a condition to admit steam through the upper port of the cylinder, by the motion produced by the common excentric or crank; the sliding plates *d*, *d*¹, continuing to move along with the D-valves, until the proper time arrives for cutting off the steam at the sluice *f*: in both these cases, the remaining portion of the stroke which the piston makes after the sluices *f*, and *f*¹, are closed, is effected by the expansion of the steam. The machinery by which the cut-off plates *d*, *d*¹, are moved, admits of some variation, depending upon the situation and upon the facility with which it may be required to be altered, so as to cut off the steam at an earlier or later portion of the stroke. When this alteration does not require to be performed whilst the engine is working, the arrangement exhibited in fig. 1, and shewn also detached, and on an enlarged scale, at figs. 3, and 4, is to be adopted. Figs. 3, and 4, are side and plan views of a common excentric and rod, placed on a fly-wheel, or other shaft, in a convenient situation. The excentric *h*, is made broader on the periphery or edge than usual, and has a groove turned in it, as in common, for the reception of the clips connected to the common excentric rod *t*; this groove is close to one edge, and on the remaining portion of the breadth is fitted a moveable cam *i*. The edge of this cam is concentric with the excentric *h*, except at the two inclined portions *j*, *j*. These inclined portions act on the friction rollers *k, k,* mounted on studs in an elliptical ring *l,* which is attached to a rod *m,* connected with the sliding plates *d,* d^1. The elliptical ring *l,* is steadied by guides *n, n,* so as to move only in a right line with the aforesaid rod *m,* to which it is attached; and the rod *m,* is connected to a bell-crank lever *o,* mounted loosely on the cross shaft *p,* which moves the D-valves. This connection with the cut-off valves or sliding plates is also shewn at fig. 1. A rod or link *q,* from this bell-crank, works the shaft *r,* which is connected by means of links *s, s,* to the rods *g,* g^1, before described, as connecting the two cutting-off slides *d,* d^1. The point at which the steam is cut off is varied, by shifting the moveable cam *i,* on the common excentric *h,* either forwards or backwards, as required. As the cam *i,* revolves along with the excentric *h,* and as the acting surface of the cam is, as stated above, concentric with the excentric, except at the points *j, j,* this motion will alternately draw the cam-rod *m,* backwards, and push it forwards. With respect to the excentric rod, in like manner it will be seen that the loose bell-crank lever *o,* will have the same motion as if it were fast in the cross shaft *p,* except at the aforesaid times, and that consequently the cut-off slides *d,* d^1, will travel with the D-valves to which they are attached, except at the time when they are cutting off the steam.

The second part of these improvements—namely, the mode of connecting the expansion apparatus with the common governor of the steam-engine, is exhibited at figs. 5, 6, and 7. As the power required in working stationary steam-engines, particularly those employed for manufacturing purposes, is seldom equable, it is desirable, in order to obtain the full amount of advantage attainable, that the steam should be cut off earlier or later in the cylinder, as the weight on the engine may vary. Fig. 5, is a plan, fig. 6, a cross section, and fig. 7, a side elevation of an arrangement of apparatus adapted for this purpose. 1, 1, is a headstock or frame, which slides on a plate or bed 2, 2; this headstock is connected by a link 3, 3, to the common excentric rod *t,* by means of the studs 4, and 5: the stud 5, should be at or near the end of the excentric rod. The headstock, connected in this way, will slide backwards and forwards in the same manner as if it were linked to a lever on the cross shaft *p*, and would consequently communicate the same motion by the link 6, to a loose lever *o*, on the cross shaft *p*, of the same length as the one engaged in the "gab" of the excentric rod, as if the said loose lever *o*, were fast on the cross shaft. All that is necessary now to complete the motion of the loose lever *o*, is to move the link 6, backwards and forwards; this is performed by means of a cam 7, (which is equal in effect to the cam *i*, in figs. 1, and 2,) which revolves on the shaft 8, bearing in the headstock, and acts on friction rollers 9, 9, as shewn in the drawing. The means by which the above cam 7, is made to revolve, and also the manner in which the whole may be controlled by the governor, are as follows:—On the fly-wheel shaft *c*, is a bevil-wheel 10, which drives a pinion 11, on a shaft 12; about midway between the fly-wheel shaft and the headstock is a coupling 13, which connects the aforesaid shaft 12, to another shaft 14, by means of a hoop and sliding key, in such a manner as to allow the shaft 14, to move backwards and forwards, in the direction of its length, the same distance that the headstock travels (*i. e.* the throw of the excentric); the other end of the shaft 14, runs in a bearing 15, attached to the headstock, and drives, by means of the bevil-wheels 16, 17, the shaft 8, the same number of revolutions in a given time as the fly-wheel shaft makes. On this shaft 8, the bevil-wheel 18, is keyed, and communicates motion to the bevil planet pinion 19, which is engaged in the bevil-wheel 20. This last-mentioned wheel 20, is keyed on the boss of the cam 7, and the cam is loose on the shaft 8. The planet pinion 19, is supported, as shewn in the sectional figure 6, in the worm-wheel 21, which gears in a worm 22, below; this worm is journalled in the bottom of the headstock in such a manner as only to allow of a motion round its own axis; the worm wheel 21, is slotted through (or has a key bed cut through its boss), and the end of a shaft 23, (in connection with the governor) with a sliding key, is fitted in it: its use will be described hereafter. It is obvious, that so long as the planet pinion 19, is stationary, the wheel 20, and consequently the cam 7, to which it is attached, will make the same number of revolutions, in a given time, as the fly-wheel shaft does; and as long as this is the case, the cam 7, will move the cutting-off slides *d*, d^1, by the means before shewn, at one certain fixed point of the stroke of the engine. Now, if the worm in the bottom of the headstock be made to revolve, it will act on the worm-wheel 21, which carries the planet pinion 19, and alter the situation of the wheel 20, on the shaft 8, and consequently shift the position of the cam 7. This shifting of the cam 7, is effected by the action of the governor, when required, as follows :—At figs. 5, and 7, the connection of the governor with the above-described apparatus is shewn. It will be seen that the lower portion of the tube or ferrule surrounding the governor spindle is provided with a pair of discs or friction pulleys 24, 24, so connected as to rise and fall, as the governor balls expand or contract by the variation of their velocity. These friction pulleys are made to act on a face-plate or disc 25, fixed either at the end of the shaft 23, or a cross shaft connected with it; and they are so arranged, that when the engine is at its proper speed they shall not be in contact with the friction plate 25; but when the balls of the governor expand, by any increase of speed, the lower friction-pulley will be raised so as to act on the face-plate, and cause it to revolve in a certain direction, and in the contrary direction when they fall below the proper velocity, so as to cause the upper friction-pulley to act on the opposite point on the surface of the face-plate. The shaft 23, must be connected with the worm 22, in the bottom of the headstock. The manner of connection will vary according to the difference of situation; in some cases it may be connected direct, in others it may require to be conveyed by small shafts and bevil or mitre-wheels, which must be so arranged as to put the cam forward,—that is, to cause the steam to be cut off sooner when the speed of the engine is too quick, and the contrary when too slow.

Fig. 8, represents a plan, fig. 9, an end view, and fig. 10, a side view of a modification of the apparatus, designed to effect the same purpose. *a*, *a*, represents a headstock, mounted on a slide, and worked in a similar manner to the one last described; the shaft *b*, is also driven in the same manner, by a shaft proceeding from the fly-wheel shaft. The cutting-off cam *f*, is also mounted on the shaft *b*, and acts against the friction-bowl *g*, placed at the end of the rod 6, in connection with the cutting-off slides. The bevil-wheel *c*, has a key in its boss, which enters a straight groove *d*, formed in the shaft *b*, and allows the shaft *b*, to move backwards or forwards in the direction of its length, at the same time that a rotary motion is communicated to it, similar to that of the fly-wheel shaft. On another portion of the shaft *b*, there is a groove *l*, cut in a helical form, so as to make about a quarter of a turn of the worm in about eight inches length. In the boss of the cutting-off cam *f*, there is also a fast key, which slides in this inclined groove *l*, and which connects the cam with the shaft. The method of altering the position of the cam *f*, on the shaft *b*, and thus cutting off the steam sooner or later, is by sliding the shaft *b*, through the bosses of both the wheel *c*, and the cam *f*, which, by reason of the key in the boss of the wheel *c*, sliding in a straight groove, and that of the cam *f*, in a helical one, they are shifted, with respect to each other, more or less. The shaft *b*, is shifted for this purpose, and held, as required, by two levers *g*, *g*, engaged, by means of a swivelling nut and screw *h*, and a small pair of mitre-wheels *i*, *i*, with the shaft 23, proceeding from the governor, which shaft, in the former arrangement, was engaged with the worm and wheel 22, and 21. It will also be evident, that, in this arrangement of the apparatus, the connection of the sliding headstock with the common excentric rod *t*, may be made as above shewn, or may be slightly varied. In the former arrangement it is in fast connection with it, and in the present they are merely connected by the shaft *b*, passing loosely through a bush or bearing *u*, in the excentric rod. Another arrangement of apparatus for connecting the cutting-off cam with the governor is shewn in elevation at fig. 11, and plan view at fig. 12. *a*, *a*, represents a fly-wheel shaft, on which the common excentric *b*, is fixed, as before described; *c*, is the cutting-off cam, shewn in section at fig. 11, and partly in section at fig. 12; *d*, a friction band, hinged at *e*; *f*, is a bolt, passing through the cutting-off cam and between the ends of the friction band; this bolt is to act as a driver or connection between the friction band and the cutting-off cam; *g*, is a pinion, with a flange, on which are certain projecting pins or studs *z, z*; this pinion is fixed on the pin *h,* which revolves, when acted on, in a hole bored through the excentric *b,* and gears with an internal wheel *y,* attached to the cutting-off cam. In this arrangement the cam is connected to the excentric by the friction of the band *d,* which friction may be adjusted by tightening the bolt *i,* (fig. 12). For this purpose a hole, as at *k,* must be left either in the periphery or the side of the cam, to admit a screw-key: a helical spring *l,* under the head of the bolt *i,* will keep the friction equable. The friction band *d,* should be sufficiently tight to overcome the resistance of working the cutting-off slide, but not so tight as to cause any unnecessary strain upon the machinery connected with it. The manner in which the cutting-off cam is moved forward or backward by the action of the governor, may be much varied. The following is one method:—*m,* is a standard, the top of which is formed into a stud, on which is mounted a piece of metal *n, n*; this piece of metal has an arm projecting from the centre, which is connected to the governor in such a manner, that if the ballsexpand, it will be pulled in one direction, as 1, 2, and if they collapse, it will be pulled in another direction, as 1, 3; and when they are at a proper state, it will assume a middle position, as 1, 4. When the above-mentioned arm is pulled in the direction 1, 2, it is evident that the projecting piece *o,* will be protruded, so that the studs *z, z,* will have to strike against it at every revolution of the fly-wheel shaft; and that when this is the case, and the fly-wheel shaft is revolving in the direction of the arrow at *q,* the pinion will be moved, each successive revolution of the fly-wheel shaft, in the direction of the arrow marked *r,* and being in gear with the teeth attached to the cam, will turn it in a corresponding direction. When the above-mentioned arm is pulled in the direction 1, 3, it is evident that the motion produced on the pinion and cam will be in the opposite direction, and when in the position 1, 4, it will have no action on the pinion, and consequently none on the cam. This may be effected by the governor as follows:—*x,* is a governor spindle; the expanding and collapsing of the balls caûse the ferule or bush to rise and fall, on which are the friction pulleys *v*, *v*^{1}, (as before); *u*, is a face-plate, plain, or nearly so, on the face, except at certain places, 5, 6, where the face is hollowed out, so that, when either of the hollows come opposite either of the friction pulleys *v*, its action will cease. The friction pulley *v*^{1}, is represented in the drawing as opposite the hollow 6; while this is the case, the pulley *v*^{1}, cannot act on the face-plate; and the crank pin on the same shaft as the face-plate *u*, will hold the rod *s*, as shewn; this will cause the cutting-off cam *c*, to be gradually shifted, as before shewn, which will alter the speed of the engine. If the friction pulley *v*, should now come into contact with the face-plate, it would turn it until the hollow 5, came opposite, at which time the weight A, would be perpendicular over the centre of the crank-pin *t*, the stop *o*, would be withdrawn, and further action on the cam would cease; but should the balls continue to collapse, the friction pulley *v*, will act on the face-plate, after it has traversed across the hollow 5, and cause the lever to assume the position marked 1, 3.

The patentee claims, Firstly,—the peculiar method of cutting off the steam in steam-engines, when worked expansively, by the application and employment of the cutting-off plates, placed in the inside of the common D or slide valve, as exhibited in the drawings; Secondly,—the application and employment of a cam or tappet, which is moveable round its axis, for the purpose of altering the time of cutting off the steam, and which is capable of being so moved, either by hand or mechanism, whilst the engine is at work; and Thirdly,— the methods of moving the said cam round its axis, for the purpose, by the action of the governor, as also exhibited in the drawings.—[*Inrolled in the Petty Bag Office, November*, 1844.]

Specification drawn by Messrs. Newton and Son.

To JOSEPH COWEN, *of Blaydon Burn, near Newcastle-upon-Tyne, merchant, for his invention of certain improvements in making retorts for generating gas for illumination.*—[Sealed 4th June, 1844.]

THESE improvements in making retorts for generating gas may be considered under two heads; firstly, the new combination of earthy and other materials, of which the retorts are to be constructed; and, secondly, the novel kind of moulds and machinery by which the retorts are to be shaped and manufactured.

The object of the patentee is to make such clay retorts for generating illuminating gas, as will be capable of withstanding the effects of the various changes of temperature to which they are required to be exposed, and consequently render them less liable to crack. To accomplish this, he proposes to mix with Newcastle fire-clay, Stourbridge fire-clay, or any other kind of clay suitable for the purpose, saw-dust, pulverised wood, charcoal, coke, carbon obtained from the interior of gas retorts, and other carbonaceous materials, in such proportions as the quality of the clay may require. The more aluminous the quality of the clay, the larger will be the quantity of carbonaceous matter required to be combined therewith. From one-twentieth to about one-fourth, by measure, of carbonaceous matter, compared to the whole mass of earthy materials employed, may be combined; this variation of quantity depending, as before stated, upon the aluminous condition of the clay,—a feature well understood by potters and the makers of clay retorts. By these means the clay is rendered partially porous, and consequently less liable to crack by the changes of temperature. Clay retorts for the generation of illuminating gas, of all forms and structures, may be made of these combinations of earthy and carbonaceous materials.

The second part of this invention applies to the peculiar kinds of moulds, and the machinery to be employed, for manufacturing gas retorts from earthy materials, which will be seen by reference to Plate II.

Fig. 1, represents the external appearance, as seen from above, of the improved machine for forming retorts of clay by compression; fig. 2, is an end view of the same; and fig. 3, shews the internal parts of the machine, by means of a longitudinal section, taken vertically. *a, a,* is a cylindrical box or chamber, into which the plastic clay and other materials are to be introduced, through a man-hole or aperture *b,* at the top; *c, d,* is a core, made toward the end *c,* to the figure of the required internal form of the retort, the other part of the core *d,* being cylindrical and hollow, for the sake of lightness. This core is placed concentrically within the cylindrical box or chamber *a*, and is made fast thereon by a stud and key *e*, to the end plate *f*, *f*, of the cylinder. A circular plate *g*, acts as a piston within the cylinder, sliding over the core *d*, for the purpose of compressing the plastic clay and other earthy materials contained therein; which piston has several rods *h*, *h*, *h*, affixed to it, whereby any actuating power or mechanical force may be applied to drive the piston forward. To the front end of the cylinder there is attached a nose-piece *i*, *i*, with a plate *k*, which, together, may be called the mould; for, on the piston being forced up, the plastic clay is made to fill up the nose-piece, and to mould or form the end of the intended retort; which, when the machine is in operation, will be known by small portions of the clay oozing through the hole or holes in the front plate *k*. It will be seen by the drawing, that the retort about to be made by this machine is nearly of the transverse sectional figure of the letter D; but to this figure the inventor does not confine himself, as any other form of retort may be made, by means of the same machinery, by altering the shape of the nose-piece *i*, *i*, and the end part of the core *c*, both of which are made moveable for that purpose.

The end of the intended clay retort being thus formed in the nose part of the machine, the plate *k*, must be removed from the nose; when, on forcing the piston *g*, forward, the plastic clay will be projected out at the end of the nose in the shape and as a continuation of the retort (the end of which had been formed as described) to any length required, in the manner shewn by the sectional fig. 3, where it may be received and supported by an endless travelling cloth, or a board and rollers; and the length of moulded clay may then be cut off by a wire in the ordinary way, and sent to the drying place.

Another form or modification of this machine is shewn in longitudinal section at fig. 4, in which, instead of the nose-piece above described, a D-formed hoop *l*, *l*, or of any other required figure, is introduced as a die; which, in commencing the operation of making the end of the clay retort, must be kept in its place, and the front of the cylindrical box closed by a plate *k*, as before. The core *c*, formed to the desired internal figure of the retort, is in this instance made fast to the piston *g*, and advances with it. When the end of the retort has been made as before described, the plate *k*, must be removed, and on now projecting the clay forward, it will assume the moulded form shewn in the front view, fig. 5, and in the section, fig. 6, in which the plate *k*, is removed. Under some circumstances the patentee proposes to use (instead of the machinery above described) peculiarly constructed hand moulds, shewn at figs. 7, and 8, for the formation of clay retorts. These moulds may be made either of wood, metal, or plaster, in two or more parts, according to the size and figure required. Fig. 7, shews a top view of one of the moulds of a D form, which is the shape most commonly used. The mould is curved at *a*, *a*, the part which is to constitute the roof or top; the bottom *b*, is a flat plate, capable of being detached, which is best suited to this form, and to ordinary-sized retorts. The two, or it may be more, parts of the mould, when combined, are to be made fast by external bracings of iron hoop *c*, *c*, with a bar *d*, keyed or screwed thereto; or, if the mould is made of plaster, rope bracings will suffice.

In commencing the operation of moulding a clay retort by means of this apparatus, the interior of a single mould is uniformly worked over, by hand, with a substantial coating of the clay; the clay is then beaten down to any required uniform thickness, which may be from about two to four inches. When this first mould has been thus coated, and so much of the clay retort shaped and finished, a similar mould is to be placed upon the top of the former, their edges perfectly coinciding, and they are then to be bolted together. This being done, the interior of the second mould is coated with clay, in like manner to the first; taking care that the plastic clay of the second operation shall be perfectly united with the edges of that produced in the former mould. In this manner the retort may be continued to any length, by erecting one mould upon another, and carefully joining them, as shewn at fig. 8. In some cases it will be found desirable to line the internal parts of the moulds with flannel or cloth, to prevent adhesion. It may be necessary for the moulds to remain upon the moulded retort for some hours, in order that the clay may become perfectly stiff before they are removed; but of this no precise instructions can be given, as it will vary, and must depend upon the consistency or stiffness of the materials used.

The patentee claims, Firstly,—the introduction, or mixing, of carbonaceous matters with the clay, previously to its being moulded into retorts for generating illuminating gas; Secondly,—the novel kinds of moulds and machinery for forming retorts of clay and other earthy materials, intended for the generating of gas, as above described.—[*Inrolled in the Petty Bag Office, December,* 1844.]

Specification drawn by Messrs. Newton and Son.

To CHARLES WATTERSON, *of the firm of Maguire, Watterson, & Co., of Manchester, in the county of Lancaster, soap manufacturer, for his invention of certain improvements in the manufacture of soap.*—[Sealed 8th May, 1844.]

THESE improvements in the manufacture of soap consist chiefly in the peculiar method or process of mixing or combining the oil or fatty matters employed, with caustic soda; and in subsequently adding water, for the purpose of converting such mixture or produce into soap. By means of this invention, it is stated that the soap is rendered of a purer and more efficient nature; and also that a considerable economy of time is effected in the operation; the soap being sufficiently hard for sale or use in the course of a few hours, instead of several days, as is the case under the ordinary process of manufacturing. The ingredients employed are nearly the same as in common use, namely, 1, all animal and vegetable oils, either mixed or separately; 2, liquid caustic soda, of the strength of 22 per cent.; 3, water as free from earthy salts, or metallic oxides, as can be obtained.

The improved process of manufacture is as follows:—To make half a ton of soap, put in a pan 7 feet in diameter, and about 2 feet deep, 784 lbs., say, of raw palm oil; as soon as the same has become fluid, add, gradually, 407 lbs. more or less (according to the quality of soap required) of liquid caustic soda, of the strength above specified, taking care to mix the ingredients thoroughly by an instrument adapted to the purpose. The heat must then be increased, and the mixture constantly moved about, to prevent it from caking on the bottom of the pan. After continuing the operation, and at the end of three or four hours, the mixture assumes a whitish appearance, and by continuing the heat the whole of the aqueous part is entirely evaporated, and the mass reduced to a perfectly dry state. The heat is now increased, and in a short time the mass becomes again of a liquid form, and changes to a brownish color, which indicates that the combination of the oil with the alkali is effected. The fire is then speedily withdrawn, and the stirring is continued so long as any fear of scorching is apprehended. When this is over, the first part, or day's operation, is concluded, and the pan may be locked up, for the purpose of cooling, or for the night, by the excise officer. The second part of the operation consists in breaking up or grinding the product, now in a solid form, into a state of powder. To this add 45 gallons of pure water (or slightly more or less,) and thoroughly agitate the mixture for about half an hour. The heat is then applied, and the contents of the pan raised to the boiling point, and kept so for about three hours, during which time the stirring and agitation must be continued. So soon as the evaporation has been carried to the desired extent, and the soap appears of a proper consistency, it is allowed to cool gradually. The whole contents of the pan (no leys or waste accruing from the operation,) while yet in a liquid state, are now put into the ordinary frames and left to cool. The day following, the contents of the frame will be found hard enough for cutting, in the usual way; and as soon as cut up, the soap is in a fit state for sale and use.—[*Inrolled in the Petty Bag Office, November,* 1844.]

Specification drawn by Messrs. Newton and Son.

To HENRY BROWN *and* THOMAS WALKER, *of Selkirk, manufacturers, for improvements on woollen carding-engines.*— [Sealed 20th October, 1842.]

THIS invention consists chiefly in receiving the wool from the finishing-cylinder of a woollen carding-engine, upon a travelling endless band of wire cards, placed beneath the cylinder, and subtending, in a greater or less degree, from a right angle therewith, according as the nature of the fibrous material may require.

The endless band of wire cards is kept rigid, and distended in breadth, by nailing to its under surface narrow strips of wood, of a triangular form, which are also secured to a piece of cloth, to keep them in their proper positions; and the whole is enclosed in a long frame, with a roller at each end, formed with suitable flutes to receive the strips of wood, as the endless band passes around them. The frame is capable of being slightly raised or lowered, to regulate the position of the endless band, as the band should never be in close contact with the cards of the finishing-cylinder, but only approximating thereto; and the frame has also a joint beneath the right-hand end of the finishing-cylinder, to admit of raising or lowering that part of the endless band which is opposed to the cylinder.

When the fibres of wool, that are stripped off the finishing-cylinder by the teeth of the endless band, are free of the cylinder, they are acted upon by a comb-bar, which has the effect of forming them into "a well-defined continuous roving;" this bar is placed in an angular direction across the upper surface of the endless band, and an oscillating movement is communicated to it, causing it to convey the fibres from the opposite side of the band to the side where they are discharged.

The roving, thus formed, is received between two endless bands, placed horizontally, and nearly in a line with the upper surface of the endless band of wire cards; but these bands travel one-fourth faster than the latter, and have a lateral movement, directly contrary to each other; by this means the roving becomes lengthened and compressed, and it is then conveyed to the machinery by which the remaining operations for converting it into thread are performed.

Over the endless band of wire cards, near the left-hand end of the long frame, before mentioned, a small roller is mounted, in a horizontal position, but at an angle of about forty-five degrees to the length of the band; and this roller is charged with emery, for the purpose of smoothing, equalizing, and sharpening the teeth of the cards.

The patentees claim, Firstly,—the mode of applying an endless belt of wire cards for removing the wool from a carding-engine, as herein described; that is, by drawing it from the cylinder nearly at right angles therewith, for forming a continuous roving; Secondly,—the application of a roller charged with emery, placed at an angle of forty-five degrees, for the purpose of preparing and sharpening the teeth of the wire cards; Thirdly,—the application of a comb-bar for forming a roving directly from the fibrous deposits conveyed by the endless cards from the finishing cylinder; Fourthly,—the application of the endless belts, in combination with the other improvements, for compressing and finishing the roving.—[*Inrolled in the Inrolment Office, April,* 1843.]

To BENJAMIN BRUNTON BLACKWELL, *of Newcastle-upon-Tyne, Gent., and* WILLIAM NORRIS, *of the city of Exeter, civil engineer, for an improvement in coating iron nails, screws, nuts, bolts, and other articles made of iron, with certain other metals.*—[Sealed 21st February, 1843.]

IN coating iron with copper by electro-deposition, it has been found that the iron is liable to be corroded, and that frequently, either during the operation, or afterwards, an oxide of iron is formed upon the article, beneath the copper coating. To prevent the articles from being thus injured, is the object of the present invention; which consists in case-hardening, or coating with lead, or an alloy of lead, nails, screws, nuts, bolts, and other articles, made of iron, previous to coating them with copper by electro-deposition.

The case-hardening may be performed by any of the ordinary methods; the mode adopted by the patentees consists in removing from the surface of the articles any scale that may adhere thereto, and then placing them, with some parings of hoof or horn, or bone-dust, in a crucible or iron box, well luted, and subjecting them to a red heat; the articles being removed as soon as a very thin film of case-hardened surface is obtained.

The iron articles may be coated with lead, or an alloy thereof, by first cleaning their surface, and then dipping them into the molten metal, in the same manner as is practised for coating iron with tin. The alloys of lead, preferred by the patentees, are two in number:—the first is formed by the addition, to any given quantity of lead, of from one-fifth to one-tenth of tin; and the second consists of fifteen parts of lead, two of tin, and one of antimony.

After receiving this first coating, the articles are ready to be placed in a solution of copper, and in the circuit of a galvanic battery; this should be done while the articles are yet hot from the first operation, and the battery should be kept at a temperature between 80° and 100° Fahr.

The patentees claim, as their invention, submitting iron, or articles of iron, to a process of being coated with copper, by galvanic means, after such articles have been case-hardened, or after they have received a coating of lead, or an alloy of lead.—[*Inrolled in the Inrolment Office, August,* 1843.]

To CHARLES LOW, *of Robinson's-row, Kingsland, in the county of Middlesex, for certain improvements in the making or manufacturing of iron and steel.*—[Sealed 25th May, 1844.]

THESE improvements consist in the use of the following materials in the manufacture of malleable iron and steel: viz., oxide of manganese, plumbago, charcoal, and nitrate of potash, soda, or lime, (preference being given to the ordinary saltpetre of commerce).

The above materials are mixed in the proportion of 42 lbs.

of oxide of manganese, 8 lbs. of plumbago, 14 lbs. of wood charcoal, and 2 lbs. of saltpetre; and 66 lbs. of this mixture are thrown into the blast furnace with each charge of ore likely to produce 480 lbs. of metal. It may be introduced, with equal advantage, into the puddling furnace, when the pig-iron is in a fused state, by throwing a few pounds of it upon the surface of the metal, every few minutes, and thoroughly incorporating it therewith, by stirring, until the 66 lbs. have been used, or until the metal begins to thicken, or "come to nature:" it is then balled, &c., as usual. The mixture may also be employed, in like proportions, for improving the quality of iron in the cupola or other furnace used by founders.

Another part of this invention consists in the application of the mixture to the manufacture of cast-steel from malleable iron, which has been made by the above processes. For this purpose, 2 or 3 lbs. of the mixture are added to every 30 lbs. of steel, when in the melting pots, during its conversion into cast-steel. Or the object may be more immediately effected by adding the ingredients (in the same relative proportions as for steel) to the malleable iron, made as above; and then the application of a moderate heat will fuse the iron in contact with the mixture, and immediately convert it into cast-steel.

The mixture should be ground previous to use; for the puddling furnace, it should be brought to a moderately fine powder, and the patentee prefers to introduce it at the top of the furnace, through a hopper or tube, which will spread it more evenly than if distributed by hand through the furnace-door; for the blast furnace and cupola, the powder may be in a coarser state.

The patentee says, "I do not claim the exact proportions above described, as they must somewhat vary for different qualities of iron ore and iron, or of the ingredients themselves; nor do I claim the use of any of the aforesaid ingredients separately, as they may have been made use of before; but I claim the use of them collectively, in the manufacture of iron or steel, either in the blast furnace, puddling furnace, cupola, or other furnace, or in the melting pot.—[*Inrolled in the Inrolment Office, November,* 1844.]

To General George Wilson, *of Cross-street, Islington, in the county of Middlesex, machinist, for certain improvements in the construction of chimneys and flues, and in furnaces, stoves, grates, or fire-places, generally.*—[Sealed 24th July, 1844.]

This invention is divided into two parts; consisting, firstly, in improvements in furnaces, stoves, grates, or fire-places; and, secondly, in improvements in chimneys and flues.

In Plate III., fig. 1, represents, in perspective, a stove, of the register or ordinary construction, with the first part of this invention applied thereto. *a*, is the grate; *b*, *b*, the fire-bars; *c*, *c*, the sides or wings of the stove; and *d*, the hearth. *e*, *e*, is an upright tubular metal passage, set in an aperture or cavity at the back of the fire-bars, and secured to the fire-place by passing bolts or screws through its wings *e**, *e**. The passage *e*, is perforated with holes, three-eighths of an inch in diameter, and about two inches apart; its transverse section may either be circular, elliptical, or of any polygonal figure; and it may be made tapering, or of the same diameter throughout. Its upper end stands three or four inches above the level of the top bar of the grate, and its lower end is level with, or a few inches below, the level of the fire-bars *b*, *b*; *f*, is a funnel-shaped passage, fixed in the opening or breast of the chimney-flue, and ascending to the throat of the flue, where it becomes contracted, as seen at *g*, *g*, and then terminates in the enlarged cylindrical portion *h*. Fig. 2, is a plan view of the fire-bars *b*, *b*.

The action of the improved grate is as follows:—Fire being kindled in the grate, in the usual manner, the requisite supply of atmospheric air, to maintain combustion, passes between the front bars and fire-bars; the lower end of the passage *e*, being open to the outer air, a supply of air is also furnished to the fuel through the apertures in the passage, and at the same time an upward current of air, of considerable velocity, is established through the passage *e*; the smoke, heated air, and gases, pass upwards into the mouth of the funnel *f*, and thence proceed through the contracted part *g,* and cylindrical portion *h,* into the chimney-shaft.

Fig. 3, is a modification of the passage *e,* fig. 1; this is shewn as an example of the means of preserving the same principle of action in cases where it may be judged necessary to vary the ornamental character of the passage *e,* to harmonise with the stove to which it is applied. In this modification, the passage *e,* is cylindrical, but at the point *i,* near the lower extremity, it is gradually contracted to about two-thirds of the diameter of the upper portion; the lower part gradually widens again below the point *i,* so as to form a funnel-shaped continuation of the upper portion of the passage *e.* The passage consists of two pieces, (whether the passage be circular, as in the present case, or of any other figure in its transverse section), bolted together at their sides *e**, *e**. One half of the tubular passage, when thus made, projects into the fire-grate, so as to be surrounded by the burning fuel, whilst the other half is contained in a cavity, formed for its reception, in the back of the chimney or stove.

The second part of this invention is represented at figs. 4, 5, and 6. Fig. 4, is a sectional perspective view of an upper or attic-chamber fire-place, with the lower portion of its chimney-flue. *a,* is the fire-place; *b, b,* the curved, or converging sides of the same, which become gradually closer, until they arrive at the point *c,* where the metal tubular passage *f,* having a contracted neck *g,* is set. The passage *f,* forms the base of the chimney-flue *d,* which, in order to improve its action, is made somewhat larger in diameter at its upper extremity *e,* than at its lower extremity. Fig. 5, represents the application of the passage *f,* as a ventilating apparatus between the inner and outer sides of a building, or between two contiguous apartments. Fig. 6, shews the mode of applying the passage *f,* to the chimney shafts of steam boiler furnaces and similar erections.

The patentee claims, as his invention, "the several constructions of mechanical parts, as regards their combination with each other, and the application of the same to the purposes of improving the construction of chimneys and flues, and in furnaces, stoves, grates, and fire-places, by increasing and facilitating the practical action, and the general effect of combustion, and of heating, in such, and by means of such said constructions; and this as I have herein set forth, described, and specified them."—[*Inrolled in the Rolls Chapel Office, January,* 1845.]

To William Craig, *engineer,* Robert Jarvie, *rope-maker, and* James Jarvie, *rope-maker, all of Glasgow, in the kingdom of Scotland, for their invention of certain improvements in machinery for preparing and spinning hemp, flax, wool, and other fibrous materials.*—[Sealed 11th August, 1841.]

This invention consists in an improved arrangement and application of certain machinery for the preparing and spinning of hemp, flax, or other fibrous substances, into threads or yarns, for the purpose of superseding manual labour, and of greatly improving the quality and also increasing the quantity of production (at a comparatively trifling expense) over any other mode of operating that has yet been brought before the public.

In prior attempts at improving the machinery for spinning rope-yarn or threads, the object appears to have been, to spin the yarns for ropes or twines upon machines fixed in their places; putting the materials through a series of complicated operations; and winding the yarn upon bobbins, by spindle and fly-frames, or into revolving cans: by either of which processes the fibres of the hemp or flax are severely injured; being broken and deranged by the centrifugal motion of the spindle or cap, and thereby giving a rough bristly surface to the yarn, which no subsequent attention can obviate. By such methods a great loss is produced, through breakage and the flying off of the loose fibres; but by the present improvement that machinery is done away with, and the spinning is effected direct from the gilling or drawing-head, common to machinery for preparing hemp and flax, and the sliver or thread is then taken down and along the common walk or rails, and spun or twisted upon the stretch. The twist being thus given, as the yarn comes from the delivering-rollers, the fibres are so run into one another that the yarn is kept equal throughout, and perfectly smooth on the surface, and that solidity produced which is so indispensably necessary to well-spun rope-yarn.

In Plate III., fig. 1, represents a partial side elevation of the common drawing-head or gilling machine A, A, for drawing hemp, flax, and other fibrous substances, (so far as it is considered necessary to exhibit the application of the invention,) with the row of gill-teeth H, in action upon the fibres conducted from the cans 1, 2, 3, to the delivering-rollers, at B.

Fig. 2, is a horizontal or bird's-eye view of the delivering parts of the same machine, shewing the delivering-rollers and tube through which the hemp or flax, or other fibrous material, passes, just before receiving the twist. As this machine is so well known, it will be unnecessary to describe it further.

Fig. 3, represents a side elevation of a twisting-machine E, E, which is somewhat similar to the common hauling-out or forming-machine, used by rope-makers, for the purpose of stranding and laying the ropes, after the yarn has been spun, either by the hand or by machinery.

Fig. 4, is a bird's eye or top view of part of the twisting-machine, shewing the different spindles or hooks in action upon the yarn, as delivered from the second drawing or gilling-machine, at G. After the hemp or flax, &c., has undergone, in the usual way, the process of spreading and first drawing, it is taken in cans to the second drawing-head or roving-head, as it may be called. This roving-head, (see fig. 1,) is, according to the present invention, to be placed at one end of a common rope-maker's walk or line of rails, with the cans, as seen in the drawing, at 1, 2, 3, &c.; and the material to be operated upon is divided into as many threads or strands as may be thought most suitable for the width of the machine, and quality of yarn to be spun. In the present, eight is the number used. These eight strands or threads, having passed through this machine, and the fibres straightened and smoothed by the gills or needles, at H, are carried through betwixt the delivering-rollers or balls and the tube K; they are then attached to the hooks *a, a, a,* of the twisting-machine. This machine is placed on the rails *b, b,* and as the motion of these two machines (the drawing and twisting) is dependent on one another, they move or stop simultaneously. The twisting-machine traverses down the railway at a speed exactly proportionate to the delivery of the threads or yarn, at the drawing-head, so as to give the requisite degree of tension to the yarn during the process of twisting. The twisting motion of the travelling-machine is produced by a continuous band or rope L, passing over the "gabb"-wheel M, and anti-friction pulleys N, N, and running the whole length of the walk or rails, in the usual way; the downward or traversing motion is produced and regulated by the friction-wheels P, P, on the rails.

When the twisting or travelling machine E, E, has reached the extreme length of the stretch, at the other end of the walk or rails, the eight threads spun are now detached from it, and laid aside: another drawing head may be here placed, exactly similar to the one described as at work at A, A; so that, by having hooks at both ends of the twisting machine, and reversing the motion of the twist, it can be made to spin and twist both up and down the walk, at pleasure, and thus save the time it would occupy in returning empty or disengaged to the head of the walk, after having spun down one stretch.

The patentees claim, Firstly,—the arrangement and application of the machines, before described, as applied to the principle of spinning and twisting, upon the stretch, all sorts of rope-yarn, threads, and twines, direct from the drawing-head or gilling-head, along the common rope walk and rails, as delineated and described; whatever may be the primary movement for setting them in action, whether by belts, bands, or wheels; and Secondly,—the application of that mode of traversing the twisting machine, which is done altogether by the friction of the wheels upon the rails; dispensing with the fixed ground rope. This could be done by toothed rails and pinions also, but the patentees prefer the friction, which admits of a little yielding on its part, as it is desirable on account of the natural elasticity of the yarn during the process of spinning. [*Inrolled in the Petty Bag Office, February,* 1842.]

Specification drawn by Messrs. Newton and Son.

To Joseph Robinson, *of Old Jewry, in the city of London, solicitor, for an invention of certain improvements in the construction and mode of working engines by the agency of air or gases, for obtaining or producing motive power,—being a communication.*—[Sealed 5th December, 1843.]

This invention consists of an improved inflammable gas or vapour engine, whereby power is obtained by the expansion consequent upon the combustion of the vapour of spirits of turpentine, or of other evaporable inflammable liquid, or of gas, or vapour, or gas and vapour combined, obtained from undistilled turpentine, or from resin, or such other substances as will produce inflammable vapour, carburetted hydrogen, or other inflammable air, by the aid of atmospheric air, within a cylinder similar to that used in the steam-engine.

In Plate II., fig. 1, is a perspective view of the improved machine; and fig. 2, is an elevation of that side not shewn in fig. 1. The other figures shew, in detail, certain parts, to be hereafter fully explained. A, is the main cylinder, which is similar to that of the double-acting steam-engine; B, is a reservoir, which is to contain the spirits of turpentine, naphtha, or evaporable liquid the vapour of which is combustible; but this reservoir will not be used when the inflammable gases are employed, as the resin or other substances from which this gas is obtained, will require a vessel to which a higher degree of heat may be applied than is necessary for the simple evaporation of liquids, as is well understood.

The inventor remarks, that it is his intention in general to use liquids of the above description, instead of carburetted hydrogen, although this latter may be substituted, wherever there are gas works, by a slight change in the generating apparatus, in combination with the other improvements in the engine. But, by the employment of the kind of liquids herein designated, the engine may be applied to purposes of locomotion, and may be used also in other situations where the gaseous hydrocarburets are not readily obtainable. In describing his engine the inventor has, therefore, supposed the apparatus for generating the inflammable vapours to constitute a component part of it.

C, is the vapour-generator, retort, or evaporating vessel, into which a portion of the liquid contained in B, is to be admitted, through the connecting tube D, which is governed by a cock, as seen in fig. 2. The retort C, is shewn in figs. 1, and 6, as having tubular openings through it, to increase its surface, and is surrounded by a case E, E, so as to leave a space between the two for the passage of heated air for warming the retort. F, is a small furnace lamp or other heating apparatus, which is placed under the centre of the retort, where the outer case E, is perforated, to admit the heat directly to the bottom of the retort. This heating apparatus, although necessary in the commencement of the action of the machine, may be dispensed with afterwards, by allowing the heated air discharged from the cylinder to be brought into contact with the retort, in a manner to be presently described; or the retort may be placed in contact with, or so near to the main cylinder, that the heat radiating therefrom will be communicated to the retort. G, is a valve-box connected with the cylinder A, so as to give a supply of the combustible gas or vapour, and of atmospheric air, at each end of the cylinder alternately, in the same manner in which steam is ordinarily supplied to the cylinder of a steam-engine. Sliding or other valves, constructed in known modes, may be used in governing this supply, and as these are well known, they do not require to be described; but a description of the revolving cylindrical valve, shewn in the drawing, may be necessary, from its peculiar construction.

The interior of the valve-box G, shewn detached at fig. 5, is made truly cylindrical, and into it is fitted a cylindrical tube H, fig. 3, which is to revolve within the box. I, is a bevil-wheel on its shaft, which is driven by gearing connected with the shaft of the fly-wheel J. The tube H, is closed at its ends, and its interior is divided into three chambers by partitions, shewn by the dotted lines *a, a*. In the middle chamber *b*, are two openings, shewn at *c, c*, and in each of the end chambers there are likewise two openings *d, d*, and *e, e*. The tube H, is represented in such a position as to shew about one half of each of these openings. K, fig. 4, is a chamber on the under side; and L, fig. 5, one on the upper side of the valve-box. M, figs. 1, and 6, is a tube, furnished with a cock, and forming a communication between the retort and the lower chamber K, for the passage of the vapour and air from the retort. From the chamber K, there are two small openings c^1, c^1, fig. 4, corresponding with those marked *c, c,* in fig. 3. The interior of this chamber is shewn at K, fig. 4; in the upper chamber L, there is a partition dividing it into two parts, as shewn at *f,* fig. 5, and on each side of this partition there are two openings, one of which, in each division, is represented by dotted lines. These are covered by clapper valves, which close by their own gravity. These openings, like those in the lower chamber K, correspond with the openings *c, c,* in fig. 1; the others, marked *g, g,* lead into the air-passages, opening into the two ends of the cylinder, in the same manner with steam-ways. The openings *d, d,* and *e, e,* in fig. 3, are exhaust openings; *e, e,* admitting the residuary contents of the cylinder to pass alternately from the ends of the cylinder into the chambers between the partitions *a, a,* and the ends of the revolving tube H. The tubes N, N, fig. 1, are exhaust tubes, leading from the exhaust openings *d, d,* into the space which surrounds the retort. The air and vapour resulting from the combustion of the inflammable compound within the cylinder is highly heated, and as it passes through the above-named space, it will communicate sufficient heat to the retort to evaporate the liquid admitted into it from the reservoir B; thus rendering the further use of the furnace or lamp F, unnecessary.

It has been already mentioned, that the heating of the retort, after the engine is at work, may be effected by placing it in contact with the cylinder. When this is done, the shape of the retort must be so altered as to adapt it to this situation: its nature and operation will not be otherwise changed. The partition *f,* in the upper valve chamber, and the clapper valves, which close the openings in the chambers, serve to prevent the explosion or combustion of the inflammable compound in one end of the cylinder, from extending beyond the partition; and immediately after such explosion has taken place, the revolving-valve cylinder H, will have passed round, so as to cut off all communication with the opposite end of the cylinder. O, fig. 2, is an escape tube, leading from the upper part of the space which surrounds the retort, into a flue or elsewhere, for conducting off the heated air and vapour after they have performed their office.

The manner of supplying the atmospheric air, which must be made to commingle with the gas or vapour, is described as follows:—P, is the cylinder of a pump, which is intended to force atmospheric air into the retort. This pump is double-acting, having a valve in each end for the admission of air, and being in other respects constructed in a manner resembling that of many blowing-machines. The air from this pump passes through a trunk Q, fig. 2; R, is an air tube, leading from the trunk Q, into the retort. Within the retort there may be an agitator, made to revolve by motion communicated to it from the current of air entering the retort, and acting upon its wings, in a manner well known, for the purpose of intimately mixing the air and vapour; or the air may be made to enter the retort through numerous small openings, for the same purpose. As the pressure of the air is to be nicely regulated, an air regulator S, is placed upon the air-trunk, its sides being formed of leather, or other elastic material; or it may be otherwise constructed in any of the well-known modes of forming such regulators; in the top of it there is a valve, through which the air escapes when the pressure becomes too great. T, is an air tube, leading from the air-trunk directly into the lower chamber K, of the valve-box. The air from the pump P, may be made to pass through either, or, in part, through both of the tubes R, and T; the openings into these tubes may be regulated by a revolving valve, or conical key, like that of a cock within the trunk Q, of which valve U, at the outer end of the said trunk, represents the handle; and by turning this handle one or other of the tubes may be closed, or they may both be left partially open.

The quantity of atmospheric air entering the retort may thus be governed, or a portion of it may be carried immediately into the valve-box, should it be desired to mix a larger quantity thereof than usual with the vapour. Fig. 6, is a vertical section from front to back, through a part of the machine in the line *, *, of fig. 2, shewing the manner in which the air-tubes R, and T, enter the retort, and the valve-box, and convey the air from the trunk Q, into them. The piston of the main cylinder may be made solid, and of metal; it is preferred, however, to be on the expanding principle.

The method of communicating motion to the fly-wheel, and to the air-pump, is described as follows:—The piston-rod V, is connected by a joint to a vibrating arm, lever, or bar, W, which is at its lower end jointed to the vibrating rod X. To the arm or lever W, the piston-rod Y, of the air-pump is also connected, and from the upper end of the lever or arm W, the connecting rod or shackle Z, extends to the crank A^1, on the fly-wheel shaft. The vibrating arm, or lever W, is supported in its place by the pendent rods B^1, which also preserve the parallelism of the piston rods V, and Y. The direction of the engine may be reversed by means of a clutch, throwing either of the wheels I, or I^1, fig. 1, into gear with the wheel *h*.

In the various explosive or gas-engines which have been heretofore constructed, one of the greatest difficulties experienced in their management has been to obtain absolute certainty in igniting the explosive mixture; and without this such engines must be valueless. It has been usually attempted to effect this by drawing a portion of the flame into openings leading into the cylinder; but the result is, in this case, extremely uncertain, and that more especially when the inflammable vapours are used; the quantity of air drawn in with the flame appearing manifestly to interfere with the production of the intended combustion.

By the combined use of the air-pump and air-regulator, and of the cocks which govern the admission of atmospheric air into the retort, or into the valve-box, and of those which govern the admission of the inflammable liquid into the retort, and the admission of the mixed air and vapour into the valve-box, the quantity of each may be adjusted, and the pressure within the cylinder regulated: this pressure is but slightly to exceed that of the atmosphere.

At each end of the cylinder there are openings, governed by valves, through which openings the ignition is to be effected, and opposite to, and nearly in contact with, them is the flame of a burning lamp. The valves which close these openings are removed a little after the crank has passed its dead centre, say when the piston has made about one-eighth of its stroke, and the cylinder has, therefore, about one-eighth of its capacity filled with the aeriform gaseous compound: there being then a slight excess of pressure above that of the external air, there will be a momentary jet of the ignitable mixture outwards, and as the supply is at that instant cut off, and the piston is travelling onwards, there will be an immediate draught inwards; as this is taking place the ignition will be effected with certainty, and the valve will then be closed.

The ignition openings are seen at *i*, *i*, fig. 2; the circular boxes, in which they are made, lead immediately into the cylinder, and as the piston passes backwards and forwards it touches a projecting piece or pin, which opens the valve at the proper time, or the valve may be opened by its own gravity, or by a slight spring, and closed by the expansion consequent on the firing; the firing not taking place until the change of action is produced by cutting off the supply.

When, in the construction of this engine, the retort is placed in contact with, or close to, the cylinder, the cylinder is warmed thereby sufficiently to prevent a condensation of the vapour in setting the engine at work. If the retort is not thus placed, the cylinder must be warmed by other means.

To prevent the main cylinder from becoming too highly heated, the inventor proposes to enclose the cylinder and its immediate appendages in a case, through which cold air may be blown, by means of a rotatory fan or other blowing apparatus, which may be worked by the engine in any convenient manner.

The patentee claims the combination and arrangement of the air-pump, the reservoir, the retort, the air regulator, the cocks which govern the admission of atmospheric air into the valve-box, and their immediate appendages, as above described; by which arrangement the inflammable vapour or gas may be supplied in regulated proportions, and a pressure produced within the cylinder, slightly exceeding that of the atmosphere, at the moment of opening one of the ignition orifices, which outward pressure is to be immediately succeeded by a draught inwards; this being effected in the manner and for the purpose above described.

He also claims the manner set forth of heating the retort by placing it in contact with the cylinder, and thus using the heat radiated therefrom for this purpose, or of employing the heated air which escapes through the eduction tubes, so as to render such air effective in heating the retort, and thereby of converting the combustible fluid employed into vapour; or of employing such heated air in combination with the heat radiated from the cylinder.—[*Inrolled in the Rolls Chapel Office, June,* 1844.]

To GEORGE WILSON, *of St. Martin's-court, St. Martin's-lane, in the county of Middlesex, stationer, for improvements in the cutting of paper for the manufacture of envelopes, and for other purposes.*—[Sealed 19th June, 1844.]

IN the ordinary mode of manufacturing envelopes, the web of machine-made paper is cut or divided longitudinally, and then by transverse cuts, at right angles to the former, it is formed into sheets, which are subdivided into pieces of the required size for each envelope; but as the sheets are rectangular, considerable waste occurs in cutting out the envelopes. To prevent this waste is the object of the present invention, which consists in making the transverse cuts in a diagonal direction across the web, instead of at right angles to the longitudinal cuts; the angle at which the transverse cuts are made being varied according to the required size or figure of the envelope.

In Plate III., fig. 1, represents a portion of a web of machine-made paper, to illustrate the patentee's mode of cutting it into sheets; *a, a,* being the longitudinal cuts; and *b, b,* the transverse cuts, which cross the web in a diagonal direction. Fig. 2, is a separate view of one of the sheets; the dotted lines indicating the manner in which it is cut into nine pieces, each suitable for making one envelope. Fig. 3, shows the mode of cutting the same number of pieces from a rectangular sheet of paper, which is attended with waste, as the pieces *c, c,* are of no use.

The patentee claims "the cutting paper for the manufacture of envelopes, whereby the sheets are cut with diagonal ends, as herein described; and whereby much of the loss heretofore consequent on cutting sheets into rectangular figures, and then cutting such sheets into envelopes, is avoided."—[*Inrolled in the Inrolment Office, December,* 1844.]

To ANDREW KURTZ, *of Liverpool, in the county of Lancaster, manufacturing chemist, for certain improvements in apparatus to be employed for drying, evaporating, distilling, torrefying, and calcining.*—[Sealed 14th February, 1844.]

THIS invention of improvements in apparatus to be employed for evaporating, distilling, torrefying, and calcining, consists in the application and employment of metallic pipes or tubes, for the passage of fire and transmission of heat over the upper surface of the pan or vessel, in which the substance or liquid submitted to such or similar operations, is contained. These metallic pipes or tubes are to be placed side by side, in a range or series, over the top of the evaporating pan or vessel, and, as the flame and heat are conducted into and passed through them, instead of acting directly on the surface of the substances under operation, as commonly done, the several operations of drying, evaporating, distilling, torrefying, and calcining, may be performed in a much more perfect and economical manner. The pipes or tubes employed for this purpose are preferred to be of cast iron, and, for operations where great heat is required, of a circular or oval form, (the heat for such operations should never exceed 1200 Fahr.); but the pipes may be made of other metals and forms, if found practicable.

In Plate II., fig. 1, is a longitudinal section, and fig. 2, a transverse section, taken through a furnace as adapted for the purposes above named. *a, a,* is the hearth or fire-place;

b, b, b, are the metallic pipes through which the fire and heat pass; they are placed under cover of the top brickwork, and over the substance or liquid to be operated upon, which may be contained in the common pan or vessel *c, c,* (constructed of either metal, brick, or stone, and adapted for any of the above purposes); *d, d,* is a flue out of the pipes *b, b,* which may either go direct into the chimney, or pass under the pan, as the operation may require; *e, e,* is a space left between the pipes *b, b,* and the substance under operation, to conduct the vapours or steam, as the case may be, either to a condenser or to the chimney; and *f, f,* are apertures or spaces left in the upper brickwork, to admit air between the metallic pipes, if required, according to the nature of the operation.

The patentee claims the application and use of metallic pipes or tubes, for the passage of flame and transmission of heat, placed over the substance or liquid to be operated upon, in furnaces or apparatus employed for drying, evaporating, distilling, torrefying, and calcining.—[*Inrolled in the Petty Bag Office, August,* 1844.]

Specification drawn by Messrs. Newton and Son.

To CHARLES HUMFREY, *of Cross-lane, St. Mary-at-Hill, in the city of London, Gent., for improvements in the manufacture of candles.*—[Sealed 24th July, 1844.]

THIS invention relates, firstly, to the manufacture of such candles as consist either entirely of lard, or of lard combined with other substances, especially with stearine; and, secondly, to the preparation of wicks for such and other candles, which are required to burn without snuffing.

In making candles of lard, or of lard combined with other materials, much inconvenience has been experienced from the tendency which the lard has to separate, in cooling, into a sort of granular structure, and the candles, made therewith, are speckled on the surface, and otherwise deteriorated in appearance: these disadvantages the patentee proposes to prevent, by suddenly chilling the candles, as soon as they are run into the moulds, and this he effects by plunging the moulds into cold water. He also states that he finds it advantageous to heat the moulds (in a steam box or otherwise,) before filling them, which prevents a defect that these candles would otherwise be liable to, viz., the splitting-up of their surface into numerous small fissures, which occasionally appear when the candles are drawn from the moulds, but more usually after being exposed for a day or two. The moulds commonly employed by the English candle-makers are not used in this process, as those moulds being fixed in a wooden frame, of from half an inch to an inch in thickness, that portion of the mould which is imbedded in the wood is protected from the chilling effect of the water, and so much of the candle will be found to be speckled and defective; the patentee, therefore, uses detached moulds, with metal cups to them, such as are usually employed by the foreign manufacturers of stearine candles.

The improvement in treating and preparing wicks consists in dipping the wicks in a solution of borate of ammonia, and then drying them. The strength of the solution is important, and upon a correct adjustment of it the proper action of the wick depends; although, as such strength must vary with the quality of the cotton, the closeness of the plait of the wick, and the quality and proportion of the ingredients of which the candle is composed, no practical rule, sufficiently general to suit such continually varying circumstances, can be given; but, assuming that the stearine is of good quality, the lard also good, and rather highly pressed, and mixed in the proportion of two-thirds of the former to one-third of the latter, and the wick such as is ordinarily used in composite candles, a solution of 25 grains, avoirdupoise, of crystallized borate of ammonia, in 1 oz., liquid measure, of distilled water, will be of the proper strength. The wicks of candles containing lard require the strongest solution, composite candles the next degree of strength, stearine candles weaker, and spermaceti weaker still.

In conclusion, the patentee says,—"Being aware that various methods of cooling the moulds of candles, by water and otherwise, for the purpose of expediting the manufacture, have heretofore been employed, I claim the processes hereinbefore firstly described, as applied to such candles only as consist of lard, or of lard combined with other materials, particularly with stearine; and, Secondly,—I claim the application and use of borate of ammonia, for the treatment and preparation of the wicks of candles, which, by their ordinary process of combustion, consume of themselves, and do not require to be snuffed."—[*Inrolled in the Rolls Chapel Office, January,* 1845.]

To John Baptist Fried Wilhelm Heimann, *of Ludgate-hill, in the city of London, merchant, for improvements in the manufacture of ropes and cables,—being a communication.*—[Sealed 8th March, 1841.]

This invention relates to the manufacture of wire ropes and cables; and consists, chiefly, in employing for that purpose, in the following manner, the apparatus represented in Plate III.—At one end of the rope-walk, to a common rope-maker's sledge, (weighted in proportion to the length and size of the rope to be made), the tackle-board, fig. 1, is fixed, having an iron axis passed through the centre of it, with a hook *a,* at one end, and a handle *b,* at the other. To posts at the other end of the walk, the tackle-board, fig. 2, is secured; in the centre of this board is a hole *c,* and around it, in a circle of twenty inches diameter, are six other holes *d, d,* equidistant from each other; in each hole a cord is inserted, having a swivel *e,* at its front end, and to the other end (after passing over a pulley behind the hole) a hook is fastened, to support the weight *f.* At intervals, along the whole length of the walk, rests, of the kind represented at fig. 3, are fixed; each rest consists of an upright wooden stake *g,* fixed in a post *h,* and having three cross bars *i, i,* at the extremities of which, and at the centre of the longest bar, hooks or open rings are placed, in a circle of twenty inches diameter. The rests and tackle-boards must be so placed, that the hook of fig. 1, will correspond with the centre hole of fig. 2, and with the centres of the rests, fig. 3; and, consequently, the six holes *d, d,* of fig. 2, will correspond with the six rings at the extremities of the cross-bars of the rests.

Six wires are now drawn out to the requisite length for the rope intended to be made, and passed through the six rings of the rests; one end of each wire is attached to the hook *a*, of fig. 1, and the other ends respectively to the swivels *e*, of fig. 2; they are drawn to an even tension by the weights *f*, and the cords of the swivels are then firmly fixed in the holes, by wooden wedges or pins. A "top" *j*, fig. 4, (formed with six equidistant grooves around it, and a perforation through the centre, as shewn, and having handles at the sides), is then placed between the wires, as close as possible to the hook *a*, in such a manner that one wire lies in each of its grooves. A seventh wire, or a cord, to form the core, is passed through the hole in the centre of the top; one end of it is fastened to the hook *a*, and the other end, after passing through the centre rings of the rests, is secured to the swivel *e*, of the cord that passes through the hole *c*, of fig. 2, and which is not wedged in its hole. The weighted sledge that carries the tackle-board, fig. 1, and which has been hitherto prevented from moving, is now loosened, and the hook *a*, turned by means of the handle *b*; the top *j*, held by one or more men, (or, if preferred, it may be fixed in a frame on wheels), is then moved regularly forward up to the swivels of fig. 2; care being taken that the wires are evenly laid around the core. The rests are successively removed and replaced when the top has passed, and the finished portion of the strand is supported by being laid on one of the cross-bars of the rests.

When six strands have been thus made, the tackle-board, fig. 2, is removed, and the board, fig. 5, is substituted for it; in this board six axes are inserted, in a circle of twenty inches diameter, having hooks at one end and handles at the other; the handles are passed through corresponding holes in the board, fig. 6, so that, by turning it, a uniform motion is given to the hooks. The six strands are fastened, at one end, to the hooks of fig. 5, and at the other end to the hook *a*, of fig. 1, and are brought to an even tension; a larger top is then introduced between the strands, and a core of hemp or other fibrous substance being passed through the hole in the centre thereof, one end is fastened to the hook *a*, and the other held by a workman. The hooks of fig. 5, are then turned in the same direction as the hook *a*, was turned in forming the strands, and the hook *a*, being now turned in the contrary direction, the strands are laid into a rope.

Instead of the apparatus shewn at fig. 5, the "jack" represented in figs. 7, and 8, may be used in laying the rope. Fig. 7, is an edge view of the jack; and fig. 8, a view of it with the front board removed. It consists of a couple of boards *k*, *l*, carrying six axes, formed with hooks at their ends, and arranged, equidistant from each other, in a circle of four feet four inches diameter; each axis is furnished with a pinion *m*, which receives motion from a cog-wheel *n*, in the centre, turned by the handle *o*.

In case the workman cannot lay the same lengths of wire so evenly as to obtain the six strands, when formed singly, of the same length, by which means alone the greatest strength can be obtained; the six strands may be formed at the same time, by using the jack, figs. 7, and 8, instead of the board, fig. 1; the tackle-board, fig. 9, instead of the tackle-board, fig. 2; and the combination of rests, fig. 10, instead of single rests, as at fig. 3. The tackle-board, fig. 9, has an axis passed through the centre of it, with a hook at one end, and a handle at the other, similar to fig. 1; this axis forms the centre of a circle, four feet four inches in diameter, pierced, at equal distances, with six holes, each of which forms the centre of a circle twenty inches in diameter, also pierced with six holes at equal distances; through each hole is passed a cord, furnished with a swivel and hook, and behind each a pulley is fixed, similar to fig. 2. Thirty-six wires for the six strands are drawn out, passed through the rings of the rests, fixed to the corresponding hooks and swivels, and weighted and fastened, as before described; then between each set of six wires a top is placed (and the tops are combined in the manner shewn at fig. 11), and the cores for the strands are added. The weighted sledge being now loosened, the hooks of the jack are put in motion, and the six strands are laid by the combined tops, fig. 11; the wires are then detached from the swivels of the tackle-board, fig. 9, the ends of all six strands attached to the hook in the centre of this board, and the rope laid in the manner before described.

The object of employing the swivels *e*, *e*, is, to prevent the individual wires from becoming twisted in themselves, when being made into ropes; yet, as wire, if drawn out beyond a certain length, in proportion to its size and strength, will twist in itself, before a turn that is given to it at one end can be communicated to the other, and such twisting tends to materially weaken the wire, the length of a perfectly sound rope must be regulated by the size and strength of the wire used; but, as ropes of great length are often required, and it is advisable to make ropes and cables with as few joints as possible, the patentee employs the apparatus represented at figs. 12, and 13, in the manufacture of such ropes. Fig. 12, shews a large drum *p*, mounted upon a shaft *q*, which turns in bearings carried by the posts *r*, *r*; one end of this shaft is hollow, as exhibited in the enlarged sectional views, fig. 14, and has two moveable upper portions q^1, q^2, hinged together at *s*, and to the shaft at *t*; these moveable portions are held firmly in their proper positions, when the rope is inserted into the hollow of the shaft, by means of metal hoops or straps, and screws. The shape of the channel for the reception of the rope is clearly shewn in figs. 14; its outer end being suitably formed for the reception of filling-pieces, for ropes of different diameters. Fig. 13, represents one-half of an apparatus, consisting of six drums, mounted upon shafts *q*, similar to that just described; but the drums and shafts are smaller than at fig. 12. The drums are in two sets, three in each; and are arranged in such a manner, that the ends of the six shafts are in a circle of four feet four inches diameter, and the ends of the three in each set describe an equilateral triangle. On the end of each shaft is a pinion *u*; and the two sets of pinions are driven by two cog-wheels *v*, upon the main shaft *w*.

The manufacture of long wire ropes, by the aid of the apparatus shewn at figs. 12, and 13, is conducted as follows:—Six strands are first made, in the manner above described, and the wires are left of unequal lengths, by altering the lengths of the cords to which the swivels are fastened; the tops, which have been moved nearly up to the first swivel, are now fastened firmly to the strands, and their connecting bars, *x*, are taken away. The jack being then removed, the strands are wound upon the six drums of fig. 13, which stands behind the jack, and the ends of the strands are fastened in the hollow parts of the shafts in such a manner, that, by replacing the connecting-bars *x*, the tops will again be combined together in the manner shewn at fig. 11. Other wires are then drawn out, and joined to the ends of the first, and the same process is repeated until the strands are formed of the required length; care being taken always to draw the wires of different lengths, that the joints may not meet together in the strands. When six strands have been thus made, and wound upon the drums of fig. 13, they are all fastened at one end to the hook of fig. 9, and the rope is laid nearly up to the drums of fig. 13; the top is then firmly attached to the rope, and fig. 9, is removed. The finished portion of the rope is now wound upon the drum *p*, fig. 12 (the strands having been previously released from the shafts, and a sufficient length unwound from the drums of fig. 13), and the end of the rope, near the top, is fastened in the hollow part of its shaft *q*; the strands are now fastened in the hollow parts of the shafts of fig. 13, and that portion of them which is extended between figs. 12, and 13, is laid into a rope by the revolution of the drums: this process is repeated until the rope is finished.

The second part of this invention has for its object the prevention of the oxidation of wire ropes; it consists in saturating the cores of hemp or other fibrous material, previous to use, with tar, or other similar material, which, by the process of laying the strands and ropes, is expressed into every crevice, and covers every wire.

The patentee does not confine himself to the number of wires and strands above mentioned, nor to the use of cores.

He claims, Firstly,—the application of swivels, *e*, *e*, as herein described, to prevent the individual wires from being twisted in themselves whilst being laid into a strand; Secondly, —the improvement in the form of the rests or supports, by which the separate wires, and the strands of wires, are retained in a circular form, and at equal distances from each other, whilst the strands and ropes are being laid; Thirdly,—the application of preservative matters, by saturating the cores of hemp or other fibrous material, before the wires are wound thereon in forming strands, and before the wire strands are wound thereon in forming ropes and cables; and Lastly,—the mode of combining machinery, as described, for the manufacture of wire ropes of any required length.—[*Inrolled in the Inrolment Office, September,* 1841.]

To WILLIAM JOHNSON, *of Bury, in the county of Lancaster, agent, for improvements in machinery or apparatus for preparing cotton, wool, flax, and other fibrous substances.*—[Sealed 23rd May, 1844.]

THE first part of this invention consists in improvements in condensing and calendering the sliver delivered from drawing-frames, and other machines employed in the preparation of cotton, wool, flax, and other fibrous substances.

In Plate II., fig. 1, is a transverse vertical section of part of a drawing-frame, with the improvements applied thereto; but the invention is equally applicable to other machines where the sliver is delivered through rollers, and pressed between calendering rollers, as hereafter explained. *a, a,* are two drawing-rollers, from which the sliver passes through a conical or funnel-shaped condensing apparatus *c,* to the calendering rollers *b, b*: these rollers revolve with the same surface speed as the drawing-rollers *a,* and hence deliver the sliver with the same speed as the drawing-rollers. The condensing apparatus (which is represented, in section, at fig. 2,) turns in bearings carried by the frame *d,* affixed to the front of the machine; it collects the sliver at its enlarged end, and by its revolution condenses the same, delivering the condensed sliver at its smaller end to the calendering rollers. Motion is communicated to the calendering rollers by the pinion *e,* upon the axis of the lower drawing-roller, driving the wheel *f*, which gears into the pinion *g*, upon the axis of the lower calendering roller. The rotation of the condensing apparatus *c*, is caused by an endless band from the pulley *h*, passing around its pulley *i*; the pulley *h*, is fixed upon the same spindle as the pulley *j*, which is driven by an endless band from the pulley *k*, on the spindle of the wheel *f*.

To improve the sliver thus condensed, instead of simply allowing it to pass between the ordinary calendering rollers *b*, *b*, as usual, and then to descend into a can, the patentee applies a pressing calendering roller *m*, in such a manner, that the sliver passes from between the rollers *b*, upwards, over the upper roller, and over the roller *m*, and then descends into a can: the sliver being directed by a guard-roller *l*, grooved in the middle. The roller *m*, rests upon the upper calendering roller *b*, and is driven by the rotation of the same.

The second part of this invention consists in a peculiar mode of giving motion to cans for receiving slivers, so that, whilst the can is turning upon its own axis, that axis is moving onwards in a circular path.

The apparatus employed for this purpose is shewn at fig. 3. *n*, is the table for the can, and *o*, the axis thereof, which turns in a bearing on the large spur-wheel *p*, and carries at its lower end the pinion *q*; the spur-wheel *p*, turns loosely upon the shaft *r*, on the lower part of which a pinion *s*, is fixed. The wheel *p*, being caused to revolve, by any convenient means, carries the axis *o*, and table *n*, round with it, and the pinion *q*, on the lower end of the axis, gearing into the stationary pinion *s*, causes the axis *o*, to rotate in its bearings, and the required movement is thus given to the can.

The patentee claims, Firstly,—the mode of condensing slivers by applying the revolving apparatus *c*, between rollers *a*, and *b*, as above described; and also the application of a roller *m*, to the calendering rollers, as above described. Secondly,—the mode of giving motion to cans for receiving slivers, as above described.—[*Inrolled in the Inrolment Office, November*, 1844.]

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from Vol. XXV. page 435.)

March 26th, 1844.

The **President** in the Chair.

"On Railway Cuttings and Embankments; with an account of some Slips in the London Clay, on the line of the London and Croydon Railway." By Charles Hutton Gregory, Grad. Inst. C. E.

The formation of the railways involving usually the excavation, removal, and employment of large quantities of earth, requires particular attention to the practical geology of the soils used; and the skill of the railway engineer is tested by the application of his knowledge of the subject, to the safe and proper forms and proportions of cuttings and embankments.

The material nature of every soil, assigns to it some particular slope, at which it will remain in repose; and this is not only as variable as the soil itself, but it is also modified by every variety of circumstance to which it is exposed. The principal change, however, for which provision is to be made, is the influence of the alternations of weather, which will seriously diminish the durability of a material, possessing in itself considerable statical strength and tenacity.

All unstratified rocks, which are equal in their substance and free from faults, may be excavated, so as to leave the sides of the cutting perpendicular or nearly so, and the material excavated may form an embankment, nearly approximating to the form of a rubble wall. In some such cases a tunnel may be formed, by merely driving a heading through the rock, without the protection of an arch of masonry. Many stones, whose strength and texture would enable them to stand at any slope, are still affected in their durability by moisture, and especially by frost; with these, provision must always be made for exfoliation to take place, without injury or obstruction to the works, by leaving a full margin at the foot of the slopes, trimming them back at a greater inclination, or forming steps or benches, upon which the falling materials may rest.

Stratified rocks, whose beds are horizontal, admit of a slope next in steepness to the unstratified; but in working through dipping strata and through the shaly beds, which frequently lie above solid rock, care is necessary, not to leave the soil in an unstable equilibrium, which the presence of water will readily destroy.

Chalk is a material, which, in those parts where it first crops out, that is, at the top of the stratum, has frequently given much trouble, from its inequality and the frequency of pot-holes of loose gravel, which, when unduly charged with water, have at times broken away the surrounding chalk, when near the edge of a cutting; lower down, where it is more compact, chalk will stand at a very steep slope, allowance being still necessary for the effect of weather. The fear sometimes felt, of deep chalk cuttings, is one for which there would appear to be but slight cause, the very fact of their depth usually involving their greater solidity. There is nothing in the nature of pure chalk, which should render it liable to heavy falls, excepting where it is exposed, unprotected, to some constantly undermining action, such as that of the sea breaking at the foot of cliffs.

The diluvial strata are, from their nature, the least compact, and therefore require the greatest slopes in excavations and embankments; the alteration, too, in their position, which, at some remote period of time, has uplifted and distorted the original horizontal strata, renders them more liable to further change of form, by facilitating the operation of water, the element to which they owe their original deposition, and to whose continued action they seem peculiarly susceptible. Of these strata, the most solid are gravel and sand, in which, when strong and clean, the slopes of excavations may be left steep, while their binding and unsubsiding qualities, render them the most suitable materials for ballasting the permanent way. The other soils of this class are extremely variable; some of the clays are firm and tenacious; others, of a marly character, are subject to slips; while quicksands and peat are soils of a proverbially treacherous character.

The nature of the soil, while it regulates the proper inclination for slopes, limits also the height of embankments and the depth of cuttings. It would be impossible, however, in a general sketch, to give any definite rules for either, as they depend on minute differences of soil, as well as the various concomitant circumstances of the case.

In rock-cuttings, many instances may be adduced, of the sides of excavations differing very slightly from the perpendicular, while the corresponding embankment may have slopes of about ¾ horizontal to 1 vertical. Excavations in chalk are commonly made (when the chalk is solid,) with slopes varying from ¼ to 1 to 1-6th to 1, the slope being increased when the material is loose. Embankments in chalk, may have slopes from 1 to 1, to ½ to 1. Excavations in gravel will stand, sometimes, at a slope of 1½ to 1, but more frequently at 1 to 1. Embankments of gravel, if good, will stand well at 1¼ or 1½ to 1. Excavations and embankments in strong sand, will stand at inclinations rather greater than in gravel. Very few clays can be trusted, either in excavation or embankment, at a less slope than 2 to 1. Both quicksand and peat require the aid of draining, before excavation is practicable; and the great quantity of earth which they invariably swallow up, renders the formation of an embankment upon either a work of great difficulty; unless the surface to be covered is previously prepared, by means of fascines or hurdles, to support the superincumbent mass.

In materials of a rigid and unyielding character (such as rock and chalk), the practical limit to the depth of a cutting, or to the height of an embankment, goes far beyond that point, at which a tunnel or viaduct would be more economical. In such materials, too, it does not become necessary to augment the inclination of the slopes, with an increased height of embankment, or depth of cutting; a step which is essential in soils of a yielding character, and becomes more necessary in proportion as the rigidity diminishes. In yielding soils there is a limit of safety, in the height of embankments and the depth of cuttings. The reason of this is obvious; the rigidity of an unyielding soil will admit of mass lying upon mass, like a wall, until the height becomes so great as to crush the base by the superincumbent weight; while a yielding soil has not sufficient tenacity to support its own weight to any great height, but sinks down bodily and spreads out at the sides. Gravel or sand will not, in general, permit with perfect safety a cutting of much above 70 feet to 80 feet in depth, or an embankment much exceeding 50 feet or 60 feet in height; and in clay the limits of safety are far more contracted. In some cases an embankment may be carried to a much greater height than it otherwise could, by forming it in several lifts above each other, and thereby allowing time for the weight to settle gradually, and to distribute itself equally over the base. The spreading of the foot of the embankment may be frequently prevented, by cutting steps in a portion of the subsoil, and punning up a footing of some more rigid soil, in the form of a revetment.

The consideration of the variable law which regulates the slopes required, in yielding materials, according to the depth of the cutting, or the height of an embankment (increased height or depth requiring increased inclination of slopes), may, perhaps, fairly lead to the conclusion, that where the height or depth is considerable, the inclination of the slopes should not be in a regular straight line, but rather in a curve, so as to have the greatest inclination at the bottom, where there is the greatest pressure, and the least at the top. This system would approach nearest to the analogy of nature, where rigid angular lines are found only in the unyielding rocky crags, while all the slopes of the more yielding soils are undulating.

In partial illustration of these preliminary remarks, the author then proceeds to give the result of his observations on the soils upon the Croydon railway, and also to place upon record some account of the slips which have occurred on that line.

The formation of the London and Croydon railway has laid open a complete section of the London clay, down to its junction with the plastic clay. The line commences, at the London end, upon the more recent alluvial formations, with a considerable depth of peat. The first embankment, after leaving the Greenwich railway, lies upon the peat, which is there about 10 feet in thickness, and beneath it are 4 feet of loose silt, and 4 feet of shingle, on the top of loose chalk, the whole full of water to within 3 feet of the surface. The greatest height of the embankment is about 25 feet, and in widening it during the past year, for the junction of the Bricklayers' Arms branch railway, it was found necessary to cut the old bank into benches, and to pound up a strong footing, to prevent lateral spreading of the new work.

Although the railway has been opened more than four years, this embankment is continually subsiding, and the amount of 'packing' required, is about double what is needed on any other equal length of the line.

Passing the New Cross station, the line enters a cutting rather more than two miles in length, through clay, which material continues in variable qualities, until a short distance from Croydon, where the gravel appears.

Immediately beyond the New Cross station, the cutting deepens, and at a distance of about a quarter of a mile, its depth, at the centre line, is 75 feet, giving, however, a depth of upwards of 80 feet to the western side, from the ground rising rapidly in that direction.

The permanent way lies upon the top of the plastic clay, and is nearly level with the bands of stone, sand, shells, and shingle, which immediately cover that stratum. Above this, again, is the strong blue London clay for a depth of 15 feet to 20 feet, and at the top is a yellow clay of a silty character, intersected with strata of the septaria, and abounding in soapy earths and various mineral salts, rendering it extremely pervious to water, and more easily affected by its action than almost any other soil.

On Tuesday, the 2nd of November, 1841, at about 8 o'clock, P.M., a movement was observed in the highest or western slope of this cutting, which is on the inside of a curve: some of the clay, washed by the continuous heavy rain of that season into a semi-fluid, crept down towards the rails from the side of the slope, which had previously been subject to frequent surface slipping. It was soon seen, that the stratum of yellow clay was in motion from top to bottom, and in the course of four hours, a mass, containing about 50,000 cubic yards of clay, had separated itself from the hill, and had sunk down, so that the back of the slip rested in a self-formed basin in the slope, while the front had slipped forward on the glass-like surface of the blue clay, and had overwhelmed the line of railway, for a length of 120 yards and a depth of 10 feet or 12 feet, while large detached blocks of blue and yellow clay had been forced up from below, and beetled over the lower part of the slip, ready to follow it.

In the removal of this slip, the exigency of the case required, that economy of work should, in many respects, give way to expedition. Stages were erected at each end of the slip, sufficiently high to allow the earth waggons to run under them and to advance gradually into the slip, as a way was made for them, by working a 'gullet' down to the rails. The waggons were then filled, partly from the gullets, partly by casting from the slope, and partly by barrow roads leading to the stages. Two sets were thus employed at the north end of the slip, and the earth was conveyed by locomotives, to the sides of the nearest embankment, while two other sets, drawn by horses, worked the clay from the south end of the slip, to the distance of about a quarter of a mile, where it was wheeled out to the spoil-bank. The work of removal was continued by a large force, day and night, and on the 18th of November, both lines of railway were cleared. On the night of the 22nd of November, the large mass of slip, still remaining on the floor, travelled forward and again covered both lines of rail. On the night of the 26th of November, a heavy movement took place on the east slope, which had meanwhile been subject to a considerable sloughing. The large mass in motion came down over the rails, and the line was not cleared until the 23rd of December, when the trains again ran through. On the morning of the 7th of January, 1842, the line was again obstructed by an extension of the slip on the west side (in a southerly direction), and as it was found, that a still greater quantity of earth was pressing forward from behind, a temporary bridge, of timber, was constructed across the line, at the south end of the slip, in order to carry away the top weight to an adjoining spoil-bank. During the whole of this time, relays of men had been unceasingly at work, day and night, in the clearing of the railway, which was at length effected, and after the 10th of February, 1842, the trains ran through regularly.

The sudden and extensive failure of so large a quantity of earth, in works constructed with every appearance of solidity, and in which, previous slips had been confined to the surface, without giving any indication in the mass itself, was naturally a subject of great interest; and a careful study of the character of the soil was necessary, to throw a light upon the operations of nature in this instance.

The slopes having generally remained for some time in a stable condition, at the inclination at which they were formed, it may be inferred, that some fresh action must have been developed, by which the equilibrium was destroyed. In most cases of slipping, this action is found to arise from the solvent property or statical force of water; and to this cause principally must, in the author's opinion, be attributed the change of form undergone by the soil of the New Cross cutting.

The main body of the excavation is in two different sorts of clay; the blue clay at the bottom, is stiff and insoluble, homogeneous in its character, and impenetrable by water; the yellow clay above, is separated from the blue by a clearly defined line, excepting, occasionally, where masses of the blue clay, of an imperfect and mixed character, run up into it. The yellow clay is extremely unequal in texture, mixed up in all directions with silt, ochre, fuller's earth, iron, lime, and bands of septaria; it is also intercepted by innumerable faults or breaks, running in all angles, from the top to the bottom; through these breaks and the soluble particles of the earth, water had gradually found its way, owing to the imperfect drainage of the adjoining fields, and an unusually wet autumn and winter, and had saturated the whole mass, until it became overcharged with moisture, the greatest quantity of water accumulating on the top of the blue clay, through which it found no outlet.

This saturation had, doubtless, been much assisted by the alternating effect of succeeding summers and winters; the soil being charged with moisture, must, during each winter, have expanded materially in bulk, and this expansion taking place laterally, had probably caused a gradual and indefinitely small movement, towards the unresisting opening left by the railway cutting; the warmth of the summer, while it dried much of the saturated mass, could not bring the particles back into their former position, and thus additional cracks would be formed, admitting greater quantities of water, so that year by year the evil would become greater, and the tendency to slip gradually increase. Again, the clay, which in a dry state is comparatively tenacious, becomes when wet almost a semifluid, and would thus be unable to support its own weight, or to maintain itself in slopes so steep and so high as in its natural state. These two causes combined, would leave the whole material in a very unstable equilibrium, shaken by every passing train, until at length the balance was destroyed, perhaps, by the hydrostatic pressure of the water which percolated through cracks at the back, or under some of the larger strata of septaria, and the mass, aided by its gravitating powers, sank down and travelled forward on the top of the blue clay, where the accumulation of water had formed a highly lubricated surface, and aided its descent.

[*To be continued.*

PRESERVATION OF STATUES AND MONUMENTS BY MEANS OF OXIDE OF COPPER.

The following Notice, extracted from a Brussels Paper, may perhaps be found worthy of attention.

There is on the Place Caroline, at Munich, an obelisk, made of bronze, *ex ære capto*, erected by the king to the memory of the 30,000 Bavarians who fell in the Russian campaign. This obelisk is surrounded by several steps of stone, which are washed by the rain running down the obelisk.

Baron de Bourgouin has observed, that this water preserved the stone from the species of greyish rust which generally accumulates upon old monuments, and which appears to be produced by moss or very minute insects lodging in the pores of the stone.

The four angles of the pedestal, which do not receive any water from the obelisk, present a great contrast, by reason of their blackish color, to those parts washed by the water which has passed over the bronze.

May we not conclude from this observation, that water, impregnated with the least portion of oxide of copper, will destroy seeds of moss, &c., as well as the eggs of animalculæ, which adhere to all unpolished stones.

It is from this cause that the marble statues at Versailles, and those in London more particularly, are so much disfigured with black and grey mould.

In the North, marble is better preserved; the intense cold appears to produce the same effect as the oxide of copper. All the statues and basins made of Carrara marble, with which Frederick the Great has loaded Potsdam and Sans-souci, seem as fresh as if placed there yesterday. As to the stone statues of that period, they are quite black and disfigured.

In order to preserve the beauty of statues, ornaments, and monuments, it may be sufficient to wash them periodically with water, containing oxide of copper in solution.

Re-cutting or scraping is not only very expensive, but does not last: as witness the façades of the Louvre, which are now of the same color as those which have not been touched. Stain and mould form great drawbacks to the beauty of statues, and paint or whitewash, with which they are often plastered over, is a very indifferent remedy.

As a medium between these two extremes, advantage should be taken of the lesson afforded by the obelisk at Munich, in order to ascertain whether something similar does not take place with the Columns of July, of the Place Vendôme, and other monuments made of copper.

The discovery of a process for preserving *chef-d'œuvres* of architecture and sculpture, should be proposed amongst the prizes offered by the learned societies, and even by government.

Scientific Adjudication.

COURT OF QUEEN'S BENCH.

Sittings at Nisi Prius, at Guildhall, before Lord Denman and a Special Jury.—Dec. 16, 1844.

LOWE *v.* PENN.

Mr. Jervis, Mr. Serjeant Byles, and Mr. M. Smith appeared for the plaintiff, James Lowe, of Kent-street, Southwark, who is a working smoke-jack maker, and had brought this action to recover from the defendant, an eminent engineer at Greenwich, compensation, in damages, for an alleged infringement of a patent which the plaintiff had taken out in September, 1838, for propelling ships and vessels on water, by a particular modification of the action of a screw, or by one or more sections of the thread of a screw, formed by curved blades placed radially upon a revolving horizontal shaft.*

There were several pleas upon the record, denying the utility of the invention, and impugning the accuracy of the specification. The principal ground of defence was, however, the want of novelty in the subject of the patent.

The following witnesses were called and examined on the part of the plaintiff:—

Mr. Carpmael.—I know Mr. Penn. He is an engineer. The plaintiff's patent is dated in 1838. I know no case in which, before the date of that patent, segments of a screw fixed upon an axis below the water line of the vessel, and revolving in that position, were used for propelling vessels. I went to Greenwich to examine the machinery of Mr. Penn, whom I saw, and Mr. Briggs. Mr. Penn explained the construction of his propellers. He asked me if they were an infringement of the plaintiff's patent, and I told him that they were undoubtedly such. I inspected a great number of drawings connected with the subject, from which it was clear that the vessels he had constructed were propelled upon the principles of the plaintiff's patent. Mr. Penn then said that he should make some arrangement with the plaintiff. Mr. Briggs proposed that the plaintiff should grant a license, and I came away with the understanding that that was to be the subject of discussion. I cannot, of my own knowledge, say that the substitution of the segment for the whole screw is an improvement in propelling; but everybody who has commenced with a screw has ended with a segment.

Cross-examined.—I am aware of Shorter's patent in 1800. It was an application of blades or segments of a screw. I never saw Lowe's patent applied to any vessel in the water. The angle in which the surface of the blade is inclined to the axis is not stated in the specification. Engineers differ as to the most efficient inclination, but about 30° is generally considered to be the best. The model of the screw which was used by Mr. Penn, and which lies horizontally in the vessel, would, if working vertically, be the same as a smoke-jack, except that, in the latter case, the interstices between the blades or sections of the screw would be filled up by vanes. I am not aware that any vessel was ever constructed under Shorter's patent of 1800, or Millington's of 1816. Brown's plan was, I believe, the same as Shorter's. I never personally tried any one of the inventions to which I refer.

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* For the full description of this invention, see Vol. XIII., p. 95, of our present Series.

Re-examined.—A smoke-jack is not formed of the segments of a screw. The vessels in which Mr. Penn had placed the propellers were called the Infant Prince and the Nile.

Mr. J. Briggs.—I am engaged in the patent thread trade. In January of last year I had an interview with Mr. Penn, and told him that he was infringing Mr. Lowe's patent. We agreed to leave the matter to Mr. Carpmael, and abide by his decision. I was afterwards present with Mr. Carpmael, at Mr. Penn's, when he examined the drawings and model, and said that Mr. Penn's propeller was a violation of Lowe's patent. Mr. Penn said, that as his father was a partner in the business, he must consult him upon the subject; but he promised that he would not again put a propeller to any vessel unless he had a license himself, or the party for whom the vessel was made had a license. Before the arrangement was completed, Mr. Penn, sen., died. Some time after his death I called upon the present Mr. Penn, who said that he should call at an early day upon his solicitor, and arrange the matter. I afterwards met him at his solicitor's. Upon Mr. Cattarn's (the solicitor) asking what we wanted, I answered, that we required that he should take out a license in the ordinary way for the future, and as to the time gone by, that Mr. Lowe would be satisfied with £5 as an acknowledgment of the patent as to the past. Mr. Penn and his solicitor then went into another room, and upon their return they refused to take the license, unless it contained a statement that he did not recognise the patent. Mr. Penn also said, that in the position which he occupied, he was afraid of compromising himself with other engineers.

Cross-examined.—When I called on Mr. Penn I had a share of 7-12ths in the patent, which I have resigned for the purpose of being a witness in this cause, but I hope to receive it back again when the cause is over. Lowe put the patent upon a vessel called the Cycloid. Smith, the inventor of the whole screw, and Wimshurst, the builder of the Archimedes, were on board of the Cycloid with Lowe when the invention was worked. Lowe was the owner of the vessel, but I am not aware that the vessel has ever been used for any purpose of trade; she has been broken up. The invention is now used in the Rattler and the Phœnix, which are Government vessels; but the Government did not take a license. The invention was placed in the Rattler by Mr. Loyd. I met him with Sir Edward Parry to examine the models. When I saw Mr. Penn, he did not tell me that his machine was upon the principle of a windmill or smoke-jack.

Re-examined by Mr. M. Smith.—My application to Sir Edward Parry was, that Lowe should be allowed to put his invention into the Rattler.

Mr. G. Bethel, an engineer, in the employment of Mr. Webster Flockton, said, that Lowe was a mechanic in Mr. Flockton's employment, who interested himself in the invention of Lowe, and bought the Wizard for the purpose of trying it. The blades, which were upon a fixed axis, were curved. We set the blades at different angles, varying from 45° to 22°, but an inclination of 30° was found to be the best. We went at first about seven knots an hour. We tried her on many different occasions, not less than 50, and went to Gravesend and Brentford. Seven miles an hour for a boat of seven-horse power was a very good rate of going. These trials were made in 1839 and 1840; I believe, in 1838 also. I saw the Archimedes while building at Wimshurst's yard. She had a place in the stern for the propeller, which was afterwards put in; it had two blades, each being a half turn of a double-threaded screw. Mr. Smith was on board the Wizard when the experiments were made. I called upon him afterwards, to remonstrate with him for using the propeller in the Archimedes.

Mr. T. Miller, an engineer, said, that the improvements in Lowe's specification were new, and were an improvement upon propellers fitted up with a whole screw. The whole screw was originally used in the Archimedes, but they afterwards substituted a half-turn of a double-threaded screw, which requires about a tenth less horse-power, and worked in a great degree without the choking action of the whole. In a screw made according to Lowe's patent, the choking would be got rid of altogether, as well as the vibratory motion. Other changes have since that time been made in the screw of the Archimedes. I know no instance in which a screw, or segments of a screw, with curved superficies, and working under the water-line of the vessel, was used before the date of Lowe's patent.

This was the plaintiff's case.

Mr. Platt (with whom were Mr. Martin and Mr. Peacock) addressed the Jury for the defence, and contended that the particulars to which the plaintiff attributed the character of novelty were not in fact new, and especially that a patent obtained by a person called Millington, in 1816, contained a description of a screw for propulsion, which had all the essential characteristics of the invention claimed by the plaintiff. The learned counsel contended, moreover, that the specification was inadequate; and finally, that there was not such an identity in the plaintiff's and defendant's propelling apparatus as to entitle the plaintiff to maintain an action for the infringement of the patent.

The following witnesses were then called for the defence:—Mr. Matthews, a person in the employment of Mr. Penn, produced examined copies of the patents of Shorter, 1800; Trevithick, 1815; Millington, 1816; and Cummerow, 1828. The propellers were fitted by Mr. Penn to the two vessels already mentioned about two years ago. The upper surface of the blades is uneven, being thicker at the middle than at the edges, and therefore convex on both sides.

Mr. Rennie, engineer.—I have attended, for several years, to the mode of propelling vessels by the screw. I have examined the propeller used by Mr. Penn in the two vessels which went to Egypt. The principle of its action is nearly that of a windmill and of a smoke-jack. The sails of the windmill are portions of a screw, and there is a curve upon the face of the sails, which is a very old principle. The only difference between Penn's propeller in principle and the sails of a windmill is, that the operating surface of the propeller is flat, and not hollow. There is no difference in principle or application between the machine described in the specification of Shorter, and that used by Mr. Penn; nor between Penn's and Millington's; nor between Penn's and Brown's; nor between Penn's and Trevithick's; nor between Penn's and Cummerow's. There is nothing new in the use of blades round a cylinder working under the water-line of a vessel for its propulsion. Shorter's, Millington's, and Trevithick's inventions provide for the water passing away at every point, except where the blade is in action.

Cross-examined.—Shorter's blades are flat, and his axis above the water-line. Millington's blades are also flat, and also above the water-line. I never knew either Shorter's, or Millington's, or Trevithick's patents in operation. I never saw or knew Brown's in operation. His plates are perfectly flat. Cummerow's patent is for a whole screw. It was used for some time in the Archimedes.

Re-examined.—I saw Lowe's vessel with his invention on board, but I did not see it in operation.

Mr. S. Brown said,—I was employed in 1825 to make a gas-engine propeller, to be placed on board a canal boat. I had used a screw to propel vessels in 1824. It was situated at the stern. I found that the whole screw would not answer, and I cut off piece by piece, until I arrived at the conclusion, that a segment of a screw was better for propelling than a whole screw. I fitted up a vessel, for which I received £300 from the company by which I was employed to fit it up. The boat was worked on the river, and hundreds of persons examined it, and I had a model on board to explain the principle to everybody who came. That is the way it got abroad. My axis worked in a stuffing-box under the water.

Mr. Farey, engineer, said,—I have examined Lowe's patent and specification. What he states therein to be his invention was certainly not new in 1838; but I find great difficulty, from the manner in which it is expressed, in discovering what it is that he does claim as his invention. His description of curved blades does not clearly explain the species of curvature, and the most probable meaning of the passage is not exemplified in the drawings which accompany the specification, and which are inconsistent with it. The plates of the screw used by Mr. Penn were curved at the surface. The propeller of Mr. Penn differs essentially from the vanes of a smoke-jack. The inventions described by Shorter, Millington, and Trevithick, are identical with Penn's propellers.

Mr. Joshua Field, of the firm of Maudslay, Sons, and Field, gave evidence in substance the same as that of the preceding witness, as to the want of novelty in the alleged invention.

Mr. Elijah Galloway gave testimony to the same effect.

Mr. Serjeant Byles replied upon the part of the plaintiff.

Lord Denman then summed up the case to the jury, who returned a verdict for the plaintiff—Damages, 40s.

The case occupied the whole day.

Sittings in Banco, January 16, 1845.

LOWE *v.* PENN.

Mr. Platt applied for a rule to grant a new trial or a nonsuit in this cause, the jury having given their verdict for the plaintiff against evidence, as the invention was proved to have been long known.—Rule granted.

COURT OF EXCHEQUER.

Special Sittings in London, before the Lord Chief Baron and a Special Jury.—January 9 *and* 10, 1845.

NEWALL *v.* WEBSTER.

Sir T. Wilde, Mr. Jervis, Mr. Webster, and Mr. Denison were for the plaintiff; and the Solicitor General, Mr. Whateley, Mr. Watson, and Mr. F. Robinson for the defendant.

Sir T. Wilde stated, that this was an action brought for infringing a patent for improvements in wire ropes, and in the machinery for making such ropes, the plaintiff not claiming to be the original inventor of wire ropes, but only of various improvements, which consisted principally in keeping the individual wires free from twist, and placing cores in the strands. There were two other improvements; one relating to a machine, and the other to the mode of fastening the rope; but, as the two he had first mentioned were those only which the defendant had infringed, he should confine the plaintiff's case to such two, which the plaintiff claimed in combination, and not separately. By law, if a party took out a patent for several things, and one was proved to have been used before, the whole patent failed; but, as these two improvements were to be taken together, the defendant could not defeat the plaintiff, by proving one to be old, but must shew the combination of the two to be so. These improvements the plaintiff claimed also, irrespective of the machinery; his case being—"I am the first person who has made wire ropes free from twist, and having cores;" and it mattered not how such ropes were made, whether by machinery or otherwise; the party making such ropes would be guilty of an infringement of the patent. The defendant's case, he believed, would be found to consist in an allegation, that they only employed their own hempen rope laying-machine, which they had used for years at their extensive manufactory near Sunderland; but that, he contended, would be no answer, unless they could shew they had made wire ropes by it of the same description before the date of the plaintiff's patent.

Mr. Carpmael, civil engineer, examined by Mr. Jervis:—He described the nature of hempen-rope manufacture; that for several years machinery had been used for making strands and ropes, one machine being called the stranding-machine, and the other the laying-machine; but in all these machines twist was given to the individual yarns and strands. He then described the plaintiff's machinery, of which a model was produced, explaining, that as the bobbin-frames always presented the same face, and were never turned themselves in the revolutions of the machine, the wires and strands were kept free from twist; that until the plaintiff's patent he never heard of wire ropes free from twist, and with cores. In his cross-examination by the Solicitor-General, the witness stated, that he never saw or heard of any hempen rope in which twist was prevented; that he was aware that to put a centre yarn in strands, and cores in ropes, when the strands exceeded three, was common in hempen rope-making; that making wire ropes was not new; they first began in Germany; afterwards, about 1835, were introduced into this country; knew Mr. Andrew Smith had obtained patents connected with wire ropes; never saw wire ropes with cores before plaintiff's patent; was of opinion that any workman of ordinary skill might make a machine, by taking the specification and drawings together; knew plaintiff had never made a machine according to his patent, to make strands and ropes at one time, but had separated the machine into seven portions, and made strands and ropes separately.

The evidence delivered by this witness was confirmed by Mr. T. Smith, of Newcastle; Capt. Eddy, agent to the lead mines of the Duke of Devonshire; Mr. Byram, agent to the collieries of Earl Fitzwilliam; Mr. Wightman, superintendent of the Blackwall Railway; and Mr. Dickson, ropemaker, of Gateshead. In the cross-examination of these witnesses, it appeared that they were not much acquainted with rope machinery; that, with the exception of Mr. T. Smith and Mr. Dickson, none of them had ever seen plaintiff's manufactory; that Mr. Dickson had never seen any wire rope except plaintiff's, and a piece he had made himself by hempen-rope machinery, by means of the register and press block, and in which the wires were twisted; that the plaintiff made strands and ropes at different times, and not at one operation, as claimed by the patent, and that, to make the separated portions of the machine, so as not to twist the wire, the proportions of the wheel-work had been altered, but which alterations, they contended, had not affected the principle of the compound machine.

Mr. Cloudsley (a workman, who was employed by plaintiff) stated, he had made the plaintiff's model without difficulty, according to the specification and drawings, with which it corresponded, and it completely answered. On cross-examination by the Solicitor-General, this witness reluctantly admitted, that when he first made the model the arms were too short, and the stud-wheels too small, and that new arms and enlarged wheels had to be provided, which had caused delay and expense; that the plaintiff had superintended the making of such model, and, notwithstanding which, the error had not been discovered until the model had been nearly completed.

Mr. Marshall, viewer of Washington Colliery, produced a piece of wire rope, which that colliery had purchased of defendant; and Mr. Carpmael, who was recalled, stated this rope was made of untwisted wires with cores, both in the strands and ropes, and was an invasion of plaintiff's patent.

The Solicitor-General, before addressing the jury for the defendant, called upon his Lordship for his construction of the plaintiff's specification, which, he contended, claimed the making wire ropes of untwisted wires, and with cores, as two separate and distinct improvements, and not in combination; for the specification, both at its beginning and end, had designated the one as the first claim, and the other as the second, and had expressly stated that one might be used without the other; and hence he contended, if one was proved to be old, the whole patent was void. He also contended, that the patent, by its title, was for machinery, and not irrespective of it; and that, therefore, as plaintiff had not proved the defendant to have used the compound machine, no infringement had been committed, and defendant would be entitled at once to a verdict.

The Lord Chief Baron stated, that the construction of the specification was matter of law, and therefore he should reserve the point for the opinion of the Court above, in case the verdict was given for the plaintiff, after hearing the defendant's case.

The Solicitor-General then opened the defendant's case, in which, after observing on the incorrectness and ambiguity of plaintiff's specification, (by which it was clear no workman could make a machine without being led into vexatious error and expensive alterations, as had been shewn by the evidence of the party whom the plaintiff himself had employed to make his model, and who, notwithstanding he had had the plaintiff's assistance, had been completely misled), he stated that, as to the first claim of the plaintiff, that of keeping the wires free from twist, he should shew that it was destitute of all novelty, being accomplished by the bobbin frames being made always to present the same face, which was precisely the principle of the hempen rope laying-machines, invented by Cartwright and others, which machines had been in use at defendant's factory for nearly half a century; that, as to plaintiff's second improvement, the use of cores in the strands and ropes, it was the common practice of all hempen ropemakers, as even plaintiff's witnesses had admitted; and which, in short, was nothing more than Huddart's Register Plate, in constant use by defendant, and all manufacturers of any reputation in that trade, and had been stated as a principle of ropemaking in several treatises, especially in *Brewster's Encyclopædia, Chapman on Cordage,* and many other works. He was aware that his learned friend would contend that, although both these improvements were, in fact, old in hempen rope manufacture, they were new in wire-rope making; but the mere change of material did not entitle the plaintiff to a patent, for he had expressly stated, on the face of his specification, that he did not claim wire ropes, or the substitution of wire for hemp; and as the plaintiff had done nothing more than take the same plan of preventing twist and using cores which had been practised in hempen rope, and merely applied the same to wire rope, he had made no discovery of any new invention, but had rather borrowed an old invention of others, and, therefore, he could not support his patent. The defendants, who, he believed, were the most extensive rope-manufacturers in the world, when wire rope became to be used in this country, finding their machinery equally well adapted to make wire as well as hempen rope, began to use it for that purpose; it being equally important to prevent twist and use cores, whether the rope were made of hemp or wire; and, therefore, all they had done was to use their old machinery, without any addition or alteration in principle. He thought the jury would pause before they arrived at the monstrous conclusion that the plaintiff should, by virtue of any patent he might have obtained, enter the defendant's manufactory, and say, "You shall not use your old machinery for making rope of any material to which it is adapted;" but, on the contrary, he contended that, in common sense, and in law, the defendants had a perfect right to use such machinery to make ropes of hemp, silk, wire, or any other material suitable for the purpose. This might become a question of law, but he should first establish the fact by evidence, and, under his Lordship's direction, he would look for their verdict; he would not, however, rest the case even on that strong ground of defence, but he trusted that he should be able to meet the plaintiff on his own ground, by proving that Mr. Andrew Smith, the first patentee of wire rope, had made wire rope free from twist, and with cores in the strands and ropes, above twelve months before the plaintiff's patent; that he should prove, by Mr. Smith and his foreman, who had sold such rope before the date of plaintiff's patent, and had submitted specimens to the Admiralty, which specimens the officers of the Admiralty would produce for the inspection of the jury. The

Solicitor-General concluded, by reminding the jury, that although it might be desirable to encourage ingenuity, it was a duty they owed to the public not to prevent competition, and thus raise a useful article in this mercantile country to an exorbitant price, by extending protection to a patentee who had made no discovery, but merely made wire rope by the ordinary means of hempen rope machinery, without any invention of his own, and without even the conception of an original idea.

Mr. Burlinson (machine-maker, Sunderland), examined by Mr. Whateley: — He had known defendant's hempen rope machinery for above twenty years. The machinery by which they now made wire rope was identically the same. The bobbin frames always presented the same face. Had made a model of plaintiff's machine from his specification and drawings, in doing which, when the model was made it would not turn round, but required the arms to be lengthened, and the stud-wheels enlarged, which caused an increase of one-twelfth of the expense, and one-third of the time of making the original machine.

Mr. Arthur Ray (engineer), examined by the Solicitor-General, gave evidence to the same effect as Mr. Burlinson, stating, that he had been many years acquainted both with rope machinery and the mode of manufacturing rope; the principle of central yarns in strands and cores in ropes had been from his earliest recollection the practice of hempen rope-makers.

Upon this, the Lord Chief Baron stated, that the fact of defendants having only used the old hempen-rope machinery, and having used cores in hempen ropes, had been clearly established, and it seemed unnecessary to call any further evidence on that point; the great question between the parties being, whether that affected the plaintiff, his case being for doing this in wire ropes only, made of untwisted wires.

A long argument ensued between the counsel on each side, after which his Lordship stated, that the cases which bore most upon the point were Lewis *v.* Davis, Lewis *v.* Mariner, and Hall *v.* Boot, the first two being in respect of a rotatory cutter for cropping cloth, and the latter case for passing gauze over a gas-lamp for singeing the fibres off lace. Whatever might be his own opinion on the decision of these cases, he should rule in accordance with them, leaving the defendants to move the Court above, if the verdict should ultimately turn out against them.—This being understood, the Solicitor-General said he should proceed on the wire-rope part of the defence.

Mr. Andrew Smith (engineer) stated that he had several patents for wire ropes; in 1839, and 1840, he had made wire ropes of untwisted wires, and with cores, both in the strands and ropes, at Grimsby and Millwall; that on the 26th of March, 1840, he had left a specimen of such ropes at the Admiralty; and further, that he had sold a large quantity of such rope before plaintiff's patent, which bore date the 7th of August, 1840. He had also rigged Sir W. Symonds' (Surveyor-General of the Navy) yacht Remus with some of his rope.

The specimen from the Admiralty was produced by Mr. Harvey (keeper of the Model Room, Somerset-house); and another piece of rope, by Mr. Bishop, marked B, which had been used in a case pending in the Court of Chancery.—Mr. Smith stated these samples were made of untwisted wires, and with cores, before the date of plaintiff's patent; and that the specimen was delivered at the Admiralty on the 26th March, 1840.

Witness was severely cross-examined, especially as to his sales of this description of wire rope, and as to these specimens being of untwisted wires.

His Lordship recommended two gentlemen on each side to examine these specimens out of court.

Captain Townshend (of the yacht Remus) proved the supplying by Mr. Smith of wire rope to that vessel; and Mr. Smith's evidence was confirmed by his foremen, Messrs. Holland and Binks.

John Farey, Esq. (civil engineer) proved the principle of the rope-making machines for preventing twist, as before stated, to be old, well known, and used before plaintiff's patent; and detailed scientifically the principles on which such machines acted. He also proved the use of cores to have been an old practice in rope-making. He then pointed out the deficiencies in plaintiff's specifications at great length. Witness also stated, that he was one of the two parties who had examined the specimens of Smith's wire rope produced, and the wires were either free from twist or had no twist that could be prejudicial.

Alexander Gordon, Esq., (marine engineer) gave evidence to the same effect, that he had in 1839 surveyed and valued Mr. Smith's machinery, which was made on principles which excluded any twist of the wires; and witness gave his opinion that there was no twist in the specimens produced.

This closed the defendants' case, on which the plaintiff's counsel recalled Capt. Eddy and Mr. Crawford (the other two parties who had examined these specimens), who gave their opinion that the wires were twisted; after which they were submitted to various modes of examination suggested by his Lordship.

The Lord Chief Baron, in summing up the case to the jury, observed, the questions of law were for the Judges of the Court, but the great questions for the jury were—first, as to the deficiency of the specification: was it such, taking the specification and drawings together, as a skilful engineer, usually employed to make such machines, could make a machine without difficulty or addition? if not, the defendants were entitled to a verdict on that issue; if it was, the plaintiff would be—pointing out that both the parties employed by plaintiff and by defendant to make the models had failed to do so; but reminding the jury that it was not such a mistake as might, by comparing one part with another, be discovered, that would invalidate the specification. The other great question, irrespective of the points of law, was, were ropes of wire free from twist, with cores in the strands, made by Mr. A. Smith before the date of plaintiff's patent; Mr. Smith at the time he so made them being aware of the importance of keeping the wires free from twist? if so, then the defendants were entitled to their verdict. If, however, they thought, looking at all the circumstances of the case, the plaintiff was the first person who discovered and duly appreciated the importance of making wire ropes with the wires free from twist, and, actually, so appreciating the importance of it, carried that into effect, by producing a wire rope so made, then he was entitled to have the benefit of his patent, and their verdict in his favour. His Lordship's summing-up lasted about three hours, and the jury retired about ten o'clock, and, after an absence of nearly half an hour, found a verdict for the plaintiff upon all the issues, with damages—40s.

Before the Lord Chief Baron, and Barons Parke and Alderson.—
January 15th, 1845.

The Solicitor-General moved for a rule *nisi* for a nonsuit, upon the points reserved at the trial, and also for a new trial, upon five other grounds of misdirection of the learned Judge. The learned counsel entered into a long detail of the evidence, resting the application for a nonsuit on the grounds—1st. That the specification claimed the machinery as the invention, and not (as his Lordship had ruled at the trial) the article produced, irrespective of such machinery; and, the machinery having been proved to be old, the plaintiff should have been nonsuited, on the authority of the case of King *v.* Wheeler.

[The Lord Chief Baron: The constructions I put upon the specification were to raise the questions for the opinion of the Court; and it is clear, that unless the plaintiff can maintain his patent for the article produced, independent of the mode of making it, he cannot succeed.]

2nd. That the making ropes of untwisted wire, and using cores, was claimed as two separate inventions, and not in combination, and are so stated, as the first and second claims in the specification, and that, inasmuch as one was proved to be old, the whole patent failed, on the authority of Brunton *v.* Hawkes.

The application for a new trial was claimed on the grounds—1st. That plaintiff, having only adopted the same method in making wire ropes as defendants had before used in making hempen ropes, the patent could not be sustained.

[The Lord Chief Baron: I have a note that this was proved to my satisfaction, and not denied by the other side.]

2nd. That his Lordship, at the trial, had directed the jury, that it was not enough to defeat the patent, that Mr. A. Smith had made wire ropes without twist before the patent was granted, unless he appreciated the importance of it at the time—the law being, that the making the article was sufficient, whether the party appreciated the importance of it or not.

3rd. That a mode of testing Mr. A. Smith's wire being twisted, which had been given by the plaintiff's witnesses, and adopted by his Lordship, was incorrect.

[The Lord Chief Baron: If that test was a mistake, surrounded as you were by scientific persons of eminence, it is singular they did not correct it at the time.]

4th. That his Lordship had directed the jury, that if Smith's wire rope had any twist at all, it would not defeat the patent, although the twist was so trifling as not to affect the rope—the utility of the rope being the ground of the invention. 5th. That the patent was too large, and if sustained would prevent the making of all kinds of wire rope, which was inconsistent with plaintiff's claim; and the patent should have been for some specific improvement.

The Lord Chief Baron: This case is not only of great consequence, both to the parties and the public, but it involves important principles of law for the judgment of the Court. Take a rule *nisi* on all the grounds.

Rule *nisi* granted.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1845.

Jan. 1. *David Gordon Laing*, of 2, Villiers-street, Strand, for a valve-cock.

2. *John Warner* and *Sons*, of 8, Crescent, Jewin-street, Cripplegate, for a glass holder and air deflector for spirit and other lamps.

4. *Thomas Wood*, of 19, Upper Barnsbury-street, Islington, for a pocket balance for coin.

6. *James Ward* and *William Colbourne*, of Stratford-on-Avon, and *John Gillett*, of Brails, Warwickshire, for an improved chaff-cutting machine.

7. *Henry Harris*, of Greenwich, for an improved glazier's diamond.

10. *The Messrs. Distin*, of London, for a Sax Horn, (a musical wind instrument).

13. *Thomas Farmer*, of Birmingham, for a card case.

13. *Luke Williams*, of 14, Upper Marylebone-street, Portland-place, for a concave bottom tea kettle.

Jan. 15. *Micah Camm*, of Greenhill, Norton, for a reaping hook.

16. *Agmor Dishim Vesey Canavan*, of H. M. 13th Light Dragoons, for a saddle-tree.

16. *Alexander Southwood Stocker*, of Wharf-road, City-road, London, for a safety envelope or letter.

17. *Samuel Parlour*, of 3, Park-road, Holloway, for a card-case.

17. *James Bromley*, of 55, Whitefriar-gate, Hull, for a night lamp.

17. *William Butler*, of Glasgow, for an improved furnace bridge.

17. *Thomas Darley Armitage*, of Louth, for the "Yarborough life buoy."

18. *Henry Potter*, of Bridge-street, Westminster, for a chromatic flute.

21. *G. J. Nicholson*, of Raymond-buildings, Gray's-inn, for an improved form of horse-shoe.

24. *A. Atherton & Co.*, of Wolverhampton, for an iron for ironing.

24. *Joseph Guise*, of 75, Margaret-street, Spa-fields, for a glass-holder for gas-burners.

27. *George Jewell*, of 55, Sloane-square, for a portable crane.

27. *Thomas Ward*, of Broad-street, Golden-square, for an improved saddle.

28. *William Crane Wilkins* and *Matthew Samuel Kendrick*, of Long-acre, London, for an improved catoptric spirit lamp.

28. *James Tildesley*, of Willenhall, Staffordshire, for a latch and catch.

List of Disclaimers
OF PARTS OF INVENTIONS AND
Amendments
MADE UNDER LORD BROUGHAM'S ACT.

Josias Christopher Gamble, of St. Helen's, Lancashire, manufacturing chemist,—disclaimer to patent, dated 14th March, 1839, for "improvements in apparatus for the manufacture of sulphate of soda, muriatic acid, chlorine, and chlorides." Filed 2nd January, 1845.

List of Patents

That have passed the Great Seal of IRELAND, to the 17*th of January*, 1845, *inclusive.*

To Henry Charles Lacy, of Kenyon House, near Manchester, in the county of Lancaster, Esq., and George Watson Buck, of Manchester, in the said county, civil engineer, for a new manufacture for, and method of sustaining, the rails of railways. Sealed 30th December.

Pierre Armand le Comte de Fontainemoreau, of Skinner's-place, Sise-lane, in the city of London, for a new mode of locomotion, applicable to railways and other roads,—being a foreign communication. Sealed 6th January.

Josias Christopher Gamble, of St. Helen's, in the county of Lancaster, manufacturing chemist, for improvements in the manufacture of sulphuric acid. Sealed 10th January.

James Pilbrow, of Tottenham, in the county of Middlesex, engineer, for certain improvements in propelling carriages on railways or common roads, and vessels on rivers or canals. Sealed 16th January.

List of Patents

Granted for SCOTLAND, subsequent to December 22nd, 1844.

To William Thomas, of Cheapside, London, for improvements in manufacturing stays, bandages, and other similar articles,—being a foreign communication. Sealed 24th December.

William Higham, of Notty-ash, near Liverpool, plumber, and David Bellhouse, of Liverpool, merchant, for improved constructions of boilers, for evaporating saline and other solutions, for the purposes of crystallization, and also for the evaporation of fluids generally. Sealed 24th December.

Joseph Lockett, of Manchester, engineer, for improvements in apparatus for preparing to be engraved or turned such copper or other metal cylinders or rollers as are to be used for printing or embossing, or calendering calico or other fabrics. Sealed 26th December.

Robert Walker, of St. Helen's, in the county of Lancaster, colliery agent and manager, for improvements in apparatus for riddling coals at collieries. Sealed 26th December.

Christopher Phipps, of River, near Dover, paper manufacturer, for an improvement or improvements in the manufacturing of paper, and in making writing and other papers, or in the machinery employed for those purposes,—being partly foreign and partly his own invention. Sealed 26th December.

James Nield, of Taunton, State of Massachusets, United States, machinist, for certain improvements in looms. Sealed 27th December.

Henry Charles Lacy, of Kenyon House, near Manchester, and George Watson Buck, of Manchester, civil engineer, for a new manufacture for, and method of sustaining, the rails of railways. Sealed 28th December.

John Swindells, of Manchester, manufacturing chemist, for several improvements in the preparation of various substances, for the purpose of dyeing and producing colors; also improvements in the application and use of several mechanical compounds, for the purpose of dyeing and producing colors, not hitherto made use of. Sealed 30th December.

Moses Poole, of London, for improvements in preparing or treating hemp, flax, and other textile plants,—being a foreign communication. Sealed 30th December.

Benjamin Baillie, of Henry-street, London, glazier and metal-frame maker, for improvements in regulating the ventilation of buildings. Sealed 31st December.

Robert Griffiths, of Smethwick, near Birmingham, engineer, for improvements in the manufacture of bolts, railway pins, spikes, and rivets. Sealed 31st December.

Guy Carleton Coffin, of Landford, in the county of Wilts, for certain improvements applicable to locomotive, marine, and stationary engines. Sealed 2nd January.

John Ainslie, farmer, Redhugh, near Dalkeith, North Britain, for a certain improvement or certain improvements in the apparatus and arrangements for the manufacture of tiles and similar articles from clay and other plastic matter. Sealed 2nd January.

George William Lenox, and John Jones, of Billiter-square, London, merchants, for improvements in the manufacture of sheaves and shells for blocks, and of bolts, rings, or washers, for the purposes of shipwrights and engineers. Sealed 9th January.

Charles Louis Mathuren Fouquet, of Jermyn-street, Haymarket, London, for improvements in the preparation of an artificial vegetable gum, to be used as a substitute for gum-senegal. Sealed 9th January.

Joseph Woods, of Bucklersbury, London, civil engineer, for improvements in producing and multiplying copies and designs, and impressions of printed or written surfaces,—being a foreign communication. Sealed 10th January.

Archibald Trail, of Great Russell-street, Bloomsbury-square, London, for an improvement in the manufacture of sails for ships and other vessels. Sealed 13th January.

Frank Fielder, of Old-street, London, for certain improvements in wire-work for the manufacturing of paper, and the application thereof to such purposes,—being a foreign communication. Sealed 13th January.

Thomas Lever Rushton, of Bolton-le-Moors, iron manufacturer, for improvements in the manufacture of iron. Sealed 14th January.

James Palmer Budd, of Ystalyfera Iron Works, Swansea, merchant, for improvements in the manufacture of iron. Sealed 17th January.

Ralph Knowles Waller, of Manchester, candle-wick manufacturer, for improvements in the manufacture of platted wicks, and in the manufacture of candles. Sealed 17th January.

Stephen Hutchison, of the London Gas Works, Vauxhall, engineer, for certain improvements in gas meters. Sealed 21st January.

Arthur Wall, of Bisterne-place, Poplar, London, surgeon, for certain improvements in the manufacture of steel, copper, and other metals. Sealed 21st January.

William Betts, of Smithfield-bars, London, distiller, and Alexander Southwood Stocker, of the same place, for improvements in bottles, jars, pots, and other similar vessels, and in the mode of manufacturing, stoppering, and covering the same. Sealed 22nd January.

Squire Diggle, of Bury, machine-maker, for certain improvements in looms for weaving. Sealed 22nd January.

New Patents
SEALED IN ENGLAND.
1844-5.

To Louis Joseph Wallerand, of Basing-lane, merchant, for improvements in dyeing or staining various kinds of fabrics,—being a communication. Sealed 30th December—6 months for inrolment.

William Betts, of Smithfield-bars, distiller, and Alexander Southwood Stocker, of the same place, Gent., for certain improvements in bottles, jars, pots, and other similar vessels, and in the mode of manufacturing, stoppering, and covering the same. Sealed 30th December—6 months for inrolment.

Alexander Bain, of Charlotte-streeet West, engineer, for improvements in apparatus for ascertaining and registering the progress and direction of ships and other vessels through water, and for ascertaining the temperature in the holds of ships and other vessels,—and for taking soundings at sea. Sealed 31st December—6 months for inrolment.

Moses Poole, of Serle-street, London, Gent., for improvements in preparing or treating hemp, flax, and other textile plants,—being a communication. Sealed 31st December—6 months for inrolment.

James Horne, of Clapham Common, Esq., for certain improvements in injecting instruments, which are also applicable to various pneumatic purposes. Sealed 2nd January, 1845—6 months for inrolment.

William Hannis Taylor, of West Strand, Gent., for certain improvements in propelling. Sealed 2nd January—6 months for inrolment.

Thomas Russell, of Fife, iron-founder, and John Peter, jun., of the Kirkland Works, for certain improvements in flax-spinning and flax-spinning machinery, which are also applicable to the manufacture of other fibrous substances. Sealed 6th January—6 months for inrolment.

Henry Lund, of the Inner Temple, Esq., for improvements in the manufacture of umbrellas and parasols.—Sealed 11th January—6 months for inrolment.

John Gollop, of Charles-street, engineer, for improvements in spring hinges, in spring roller blinds, and in applying springs to easy chairs and carriages.—Sealed 11th January—6 months for inrolment.

Robert Griffiths, of Smethwick, Stafford, engineer, for improvements in the manufacture of bolts, railway pins, spikes, and rivets. Sealed 11th January—6 months for inrolment.

George Spencer, of Hungerford-street, West Strand, engineer's draftsman, for improvements in propelling vessels on inland waters. Sealed 11th January—6 months for inrolment.

George Bell, of Pembroke-road, Dublin, merchant, for improvements in drying malt, grain, and seeds. Sealed 11th January—6 months for inrolment.

Stephen Perry, of Woodland-place, St. John's Wood, Gent., for improvements in the application of springs to locks and other fastenings, to paper-holders, to candle lamps, to blinds, window sashes, and doors, and to seats and elastic surfaces for sitting and reclining on. Sealed 11th January—6 months for inrolment.

William Tudor Mabley, of West Lambrook, Somersetshire, engineer, for certain improvements in the manufacture of buttons from horn or hoof, and other matters requiring similar pressure, and in the manufacture of other articles in dies from horn or hoof, and other matters requiring similar pressure. Sealed 11th January—6 months for inrolment.

Squire Diggle, of Bury, Lancashire, machine maker, for certain improvements in looms for weaving. Sealed 11th January—6 months for inrolment.

John Ross, of Woodbridge, Suffolk, dissenting minister, for improved machinery for platting or braiding straw, grass, and other materials, principally designed to produce what is called or known as Tuscan or Leghorn braided straw, for hats and bonnets,—being a communication. Sealed 11th January—6 months for inrolment.

Henry Cartwright, of the Dean, near Broseley, Salop, farmer, for certain improvements in the construction of paddle-wheels. Sealed 11th January—6 months for inrolment.

Samuel Porritt, of Edenfield, Lancashire, manufacturer, for certain improvements in machinery or apparatus for preparing and carding wool. Sealed 11th January—6 months for inrolment.

Thomas Keasley, of Bermondsey, Surrey, tanner, for certain improvements in the manufacture of leather, part or parts of which improvements are also applicable to other useful purposes. Sealed 11th January—6 months for inrolment.

Henry Charles Lacy, of Kenyon House, Manchester, Esq., and George Watson Buck, of Manchester, civil engineer, for a new manufacture for, and method of, sustaining the rails of railways. Sealed 14th January—6 months for inrolment.

Edwin Lucas, of Birmingham, machinist, for certain improvements in the manufacture of chains. Sealed 16th January—6 months for inrolment.

William Hunt, of Dodderhill, Worcester, brick-maker, for improved apparatus to be used for burning coal; also improved apparatus to be used for applying heat to effect evaporation of certain solutions. Sealed 16th January—6 months for inrolment.

John James Osborne, of Macclesfield, Gent., for certain improvements in the manufacture of iron and steel, and in the furnaces to be employed for such or similar manufactures,—being a communication. Sealed 16th January—6 months for inrolment.

Henry Adolphe Dubern, of Paris, merchant, for improvements in atmospheric railways,—being a communication. Sealed 16th January—6 months for inrolment.

Paul Godefroy, of Ludgate-hill, merchant, for improvements in printing calico and other fabrics. Sealed 16th January—6 months for inrolment.

Louis Joseph Lecour, of Leicester-square, for improvements in apparatus for moving the warp in looms. Sealed 16th January—6 months for inrolment.

Augustus William Gadesden, of Woburn-square, Gent., for improvements in the manufacture of sugar. Sealed 16th January—6 months for inrolment.

James Palmer Budd, of Ystalyfera Iron Works, Swansea, merchant, for improvements in the manufacture of iron. Sealed 16th January—6 months for inrolment.

Edward Loysel de la Lantais, of Walsingham-place, Kennington-road, engineer, for improvements in making infusions of tea, coffee, and other materials. Sealed 16th January—6 months for inrolment.

John Cox and George Cox, of Gorgie Mills, Edinburgh, tanners and glue-makers, for improvements in tanning and leather-dressing. Sealed 16th January—6 months for inrolment.

Isaac Abraham Boss, of Bury-street, London, merchant, for certain improvements in the manufacture of parasols and umbrellas. Sealed 16th January—6 months for inrolment.

Felix Moreau, of Ghent, in the kingdom of Belgium, engineer, for improvements in the manufacture of corks and other similar articles made of cork, wood, or other materials, and in the application of certain of the refuse matters to various useful purposes for which they have never heretofore been employed. Sealed 18th January—6 months for inrolment.

Edward Brown Wilson, of Kingston-upon-Hull, merchant, for certain improvements in machinery for twisting, roving, and spinning cotton, flax, silk, wool, and other fibrous substances. Sealed 18th January—6 months for inrolment.

Caleb Bedells, of the borough of Leicester, manufacturer, for improvements in the manufacture of braces. Sealed 21st January—6 months for inrolment.

John Seller, of Whitby, Yorkshire, Gent., for improvements in machinery to be used for drain-cutting and subsoiling. Sealed 21st January—6 months for inrolment.

Thomas Turner Chatwin, of Birmingham, button manufacturer, and George Seymour, of the same place, tool-maker, for improvements in the manufacture of covered buttons. Sealed 21st January—6 months for inrolment.

John Melville, of Upper Harley-street, Middlesex, Esq. for improvements in propelling vessels. Sealed 21st January—6 months for inrolment.

Thomas Noton, of Deanstone Works, Perth, manager of cotton works, for improvements in power looms, for the manufacture of cloth from cotton, wool, and other fibrous substances. Sealed 21st January—2 months for inrolment.

James Tarver, of Daventry, Northamptonshire, iron-founder, for certain improvements in machinery or apparatus for cutting, grinding, and dressing vegetable substances. Sealed 21st January—6 months for inrolment.

William Schnebly, of Lambeth, engineer, for certain improvements in machinery for letter-press or surface-printing. Sealed 21st January—6 months for inrolment.

William Yates, of Manchester, upholsterer, and Denis Dolan, of the same place, scagliola manufacturer, for certain improvements in plastic manufacture or composition, part of which is applicable to decorative and useful purposes, and part as a fire-proof cement or plaster. Sealed 21st January—6 months for inrolment.

John Smith, of Highbury Grange, Islington, merchant, for improved means and apparatus for shaping hats,—being a communication. Sealed 21st January—6 months for inrolment.

John Clay, of Edgely, Cheshire, corn dealer, for an improved apparatus for consuming smoke. Sealed 23rd January—6 months for inrolment.

George Joseph Green, of Birmingham, manufacturer, for a certain improvement in or addition to harness or harness furniture. Sealed 23rd January—6 months for inrolment.

Peter Borrie, of Princes-square, St. George's in the East, engineer, for improvements in the construction and fitting or equipping of ships or vessels. Sealed 23rd January—6 months for inrolment.

CELESTIAL PHENOMENA FOR FEBRUARY, 1845.

D.	H.	M.	
1			Clock before the sun, 13m. 56s.
	—		☽ rises 2h. 38m. M.
	—		☽ passes mer. 6h. 58m. M.
	—		☽ sets 11h. 13m. M.
2	4	9	☿ in conj. with ♀ diff. of dec. 1. 2. N.
3			Occul. *Xi* ^{1} *m* Sagittarii, im. 17h. 22m. em. 18h. 16m.
	6	15	♃'s first sat. will em.
	12	0	♃ in Perihelion
	23		☽ in Perigee
4	2	0	♀ in the descending node
	10	19	☿ in conj. with the ☽ diff. of dec. 3. 7. S.
	11	30	♀ in conj. with the ☽ diff. of dec. 3. 35. S.
	16	46	☿ greatest elong. 25. 38. W.
5			Clock before the sun, 14m. 21s.
	—		☽ rises 6h. 20m. M.
	—		☽ passes mer. 10h. 58m. M.
	—		☽ sets 3h. 43m. A.
6	5	52	♃'s second sat. will em.
	6	35	Ecliptic conj. or ● new moon
	20	16	♃ in conj. with ♅ diff. of dec. 5. 15. S.
8	19	48	☿ in the descending node.
9	17	34	♅ in conj. with the ☽ diff. of dec. 5. 15. S.
	18	25	♃ in conj. with the ☽ diff. of dec. 5. 44. S.
10			Clock before the sun, 14m. 33s.
	—		☽ rises 8h. 29m. M.
	—		☽ passes mer. 3h. 13m. A.
	—		☽ sets 10h. 9m. A.
	8	10	♃'s first sat. will em.
11	22	8	Juno in oppo. to the ⊙ intens. of light 1·416
13	5	30	♀ in conj. with Ceres, diff. of dec. 4. 7. S.
	8	28	♃'s second sat. will em.
14			Mercury R. A. 20h. 16m. dec. 20. 31. S.
	—		Venus R. A. 20h. 20m. dec. 19. 57. S.
	—		Mars R. A. 16h. 59m. dec. 22. 26. S.
	—		Vesta R. A. 23h. 31m. dec. 8. 36. S.
	—		Juno R. A. 9h. 28m. dec. 4. 32. N.
	—		Pallas R. A. 19h. 26m. dec. 5. 4. N.
	—		Ceres R. A. 20h. 18m. dec. 24. 31. S.
	—		Jupiter R. A. 0h. 20m. dec. 0. 56. N.
	—		Saturn R. A. 20h. 57m. dec. 17. 59. S.
	—		Georg. R. A. 0h. 15m. dec. 0. 58. N.
	—		Mercury passes mer. 22h. 40m.
	—		Venus passes mer. 22h. 44m.
	—		Mars passes mer. 19h. 20m.
	—		Jupiter passes mer. 2h. 42m.
	—		Saturn passes mer. 23h. 16m.
	—		Her. passes mer. 2h. 38m.
	5	0	☽ in □ or first quarter
	12	19	☿ in conj. with Ceres, diff. of dec. 3. 46. N.
			Occul. *w*2 Tauri, im. 10h. 54m. em. 11h. 57m.
15			Clock before the sun, 14m. 29s.
	—		☽ rises 10h. 20m. M.
	—		☽ passes mer. 6h. 21m. A.
	—		☽ sets 1h. 31m. M.
	16		☽ in Apogee
18	23	26	☿ in Aphelion
20			Clock before the sun, 14m. 1s.
	—		☽ rises 3h. 53m. A.
	—		☽ passes mer. 11h. 8m. A.
	—		☽ sets 5h. 45m. M.
	18	23	☿ in conj. with ♀ diff. of dec. 0. 48. S.
21	6	31	♃'s third sat. will em.
	13	51	☿ in conj. with ♄ diff. of dec. 0. 53. S.
			Occul. *C* Sextantis, im. 9h. 57m. em. 11h. 10m.
	17	59	♀ in conj. with the ♄ diff. of dec. 0. 2. S.
22	6	46	Ecliptic oppo. or ○ full moon
			Occul. *u* Leonis, im. 10h. 21m. em. 11h. 5m.
25			Clock before the sun, 13m. 19s.
	—		☽ rises 9h 56m. A.
	—		☽ passes mer. 2h. 15m. M.
	—		☽ sets 7h. 38m. M.
26	6	30	♃'s first sat. will em.

J. LEWTHWAITE, Rotherhithe.

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No. CLIX.

RECENT PATENTS.

To Edwin Sheppard, *of Manchester, in the county of Lancaster, joiner, for certain improvements in machinery or apparatus for planing, sawing, and cutting wood, and other substances.*—[Sealed 8th February, 1844.]

These improvements in machinery or apparatus for planing, sawing, and cutting wood, and other substances, consist principally in the application and employment of rotary cutters or cutting tools, revolving in the plane of the surface operated upon, in combination or conjunction with an ordinary planing machine, as used for planing iron, for performing such or similar operations upon wood.

In Plate IV., fig. 1, is a plan or horizontal view of an ordinary iron planing machine, adapted to perform such operations upon wood, with the improvements applied thereto. Fig. 2, is a side or longitudinal elevation of the same; fig. 3, is a front or end view of the machine, taken in front of the cutting apparatus; and fig. 4, is a back or end view of the machine, taken behind the cutting apparatus. As the ordinary planing machine is well known and understood, it will be unnecessary to detail its various operations. The description will therefore be confined to the illustration of the improved apparatus as applied thereto. A, A, is the bed of the planing machine; B, B, the table upon which the work or timber to be operated upon, is placed; C, C, the side standards or upright framing for supporting the upper planing or cutting apparatus, and vertical slides, D, D, and cross slide, E, E; F, F, is the tool-slide for supporting the side-cutting or grooving apparatus; G, G, is the ordinary driving gear and reversing apparatus, for working the table; being driven by the strap H, proceeding from any primary moving power. The board, plank, or timber, to be operated upon, is to be secured by clamps, or other convenient fastenings, on the table B, as represented at *a, a*; and as the table travels upon its bed, the board *a, a,* is passed under the upper cutting or planing apparatus. This apparatus is attached by brackets or bearings *b, b,* to the cross slide E, E, and consists of an upright spindle *c,* having a driving-pulley *d,* at the top, and a circular disc or tool-holder *e, e,* below, which is provided with any suitable number of cutting tools, blades, or plane-irons *f, f, f,* capable of adjustment to accommodate the quality of the cut to be made. A driving-strap *g, g,* passes around the fast pulley *d,* and will thus cause the rotary planing apparatus to plane or smooth the surface of the timber upon the table as it passes through the machine—one passage of the table being generally sufficient for ordinary work; the planed work may now be removed, the table reversed and returned at a quicker speed, as usual, and another board supplied ready for the next passage of the table. In order to cut or plane the sides or edges of boards, &c., at right angles to, and simultaneously with, the surface,—or to cut grooves, or feathers, or tongues, in the same, for jointing,—there are similar bearings *h, h,* capable of adjustment, attached to the tool-slide, which support other upright spindles *i, i,* also furnished with cutters or tools *k, k,* below, and a driving pulley *l, l*; and as the driving-strap *g,* is also passed around these pulleys, it is evident that the cutting tools *k, k,* will be made to plane or otherwise cut the sides or edges of the boards, &c., at the same time and speed that the surface planing is being accomplished by the means above described. Fig. 5, shews a modification of this arrangement of the apparatus, in which circular saws *l,* l,** are employed for grooving, in connection with the ordinary planing machine, instead of the rotary tools or cutters *k, k.* This machinery may also be readily adapted for the purposes of cutting mouldings, or other similar devices in wood, by a suitable form or arrangement of the rotary cutting tool; and is exhibited in fig. 6, which is a side or end view; and fig. 7, which is a front view of an apparatus adapted for this purpose, and shewn as applied to the common planing machine, by means of other bearings or brackets *m, m,* also cast on, or attached to, the tool-slides; *n, n,* being the shaft (in this instance placed horizontally), *o, o,* the cutting tool, shaped to the form of the moulding intended to be cut; and *p,* the driving-pulley, which must be so speeded as to cause the cutting tool to revolve at a great velocity. It remains only to remark, in conclusion, that the boards, &c. must be suitably guided in their progress through the machine by guide-rollers, as at *q, q, q;* and that each cutting tool shaft may also be provided with a loose pulley, as at *r, r, r,* to facilitate the stopping and starting of the working parts.

The patentee claims the application and employment of rotary cutters, or cutting tools, in combination or connexion with the ordinary (iron) planing machine or engine, for planing, sawing, and cutting wood, as shewn and described.—[*Inrolled in the Petty Bag Office, August,* 1844.]

Specification drawn by Messrs. Newton and Son.

To JOSHUA SHAW, *of Goswell-street-road, in the county of Middlesex, artist, for certain improvements in discharging ordnance, muskets, fowling-pieces, and other fire-arms.*—[Sealed 17th November, 1840.]

IN discharging fire-arms, of whatever description, according to the present invention, the powder is ignited by means of a percussion cap, charged with fulminating powder in the ordinary way; but when used for the discharging of small arms, percussion caps of a size considerably smaller than those in ordinary use are employed; and for the discharge of cannon they need not be larger than those now employed with small arms. A distinguishing feature of this invention is the manner of employing or using these caps, which, under all the modifications thereof, is by placing them upon one end of a cylindrical rod or wire, of steel, or other metal—which rod or wire, for distinction sake, is called a piston—and inserting the said piston, with a cap on the end thereof, into a cylindrical opening, occupying the place of the ordinary nipple, or otherwise conveniently situated; the opening being adapted in size to the piston, which is to slide freely, but closely, within it. The cylindrical piston is a trifle larger in its diameter than the outside diameter of the cap which is placed upon it, but its end is turned down, or reduced in size, so as to pass into, and be embraced by the cap. The hole or opening, into which the piston is to pass, contains, in some part of it, a piece of leather, cork, or other elastic substance, to embrace the piston, and render the passage air and water-tight; whilst, at the same time, the material will serve, by its elasticity, to hold the piston in its place; or the piston may be retained by a spring.

In small arms, the hole or opening through which the piston passes may be of equal bore throughout, as the piston is, in some cases, to be of sufficient length to enter the chamber of the barrel, and to extend across it, so that the percussion cap, which is placed upon its end, may be brought into contact with the interior of the chamber, on the side opposite to that at which it entered; and it is manifest, that if the outer end of the piston be then struck by a hammer or mallet, the percussion cap will explode, and the gunpowder will be ignited.

In pieces of ordnance there are sundry objections to allowing the piston to extend across the chamber of the gun; and from the thickness of the breech in arms of this description, a sufficient depth is obtained in the solid metal for the operation of the piston, without its entering the chamber of the gun. In using the piston, with the percussion cap at its end, for the discharge of ordnance, a hole is bored, in the manner, and generally in the place, of the ordinary touch-hole; such hole being of the size of the piston intended to be used, say 3-16ths of an inch in diameter, more or less, and extending down nearly to the chamber of the gun, say within a quarter or half an inch thereof; and through this remaining part a hole of much smaller size, say 1-16th of an inch in diameter, is drilled, until it enters the chamber. The piston must be of such length as to extend down to the bottom of the larger portion of the bore, and to rise to a sufficient height above the top of it for the action of the hammer, by which it is to be struck. Its lower end, or that which enters the bore, is, as above stated, to be turned down, so as to form a nipple for the reception of the percussion cap. The percussion cap, used under this modification of the invention, has a small hole, say 1-16th of an inch in diameter, made through the centre of what in the ordinary cap is its closed end: this is done before the cap is charged with percussion powder. When the piston is inserted in the bore, with a percussion cap, of the kind just described, on its lower end, if the piston be struck by a mallet or hammer on its upper end, the cap will explode, and the ignited percussion powder will pass through the hole in the head of the cap, and through the small part of the bore under it, into the chamber of the cannon, where it will ignite the powder.

A small hole is sometimes drilled in the end of the piston, in the direction of its axis, which hole may be from 1-8th to 1-4th of an inch in depth, and of the same size with that in the percussion cap, and also with that leading into the chamber of the gun; this hole is to be filled with common gunpowder, which will be ignited by the percussion powder. By using this device, the percussion caps may be very lightly charged with percussion powder; the gunpowder greatly aiding in causing the discharge of the cannon. This is a point of considerable importance, as the destructive influence of the percussion powder upon the parts with which it is in direct contact, is thereby, to a considerable extent, obviated. It may also be remarked, that the percussion cap, which remains upon the piston, after the discharge, has the effect of protecting it and the adjacent parts from injury by the percussion powder.

The manner in which the improvements may be carried into operation, will be understood by reference to Plate V.

Figs. 1, and 2, represent two modes in which the invention may be conveniently applied to small arms. In fig. 1, *a*, is a perforated screw-nut, which screws into the barrel at the place usually occupied by the nipple, or in any other preferred situation: the end of this screw is to be flush with the inside of the chamber. *b*, is a screw on the upper part of this nut, upon which there is fitted a screw-cap *c*; the cavity in this cap is somewhat deeper than the length of the screw *b*, in order to admit of the insertion of a piece of leather, or other elastic substance, through which the stem of the piston *d*, *e*, is to pass; this stem is cylindrical, and the holes in the nut and cap, through which it passes, must be adapted to it in size, so that the piston may slide in and out easily, and yet have no shake. Fig. 3, is a section of fig. 1, shewing the piston, and the piece of leather, cork, or other suitable material, *g*, for retaining it in its proper place.

Fig. 2, is another method of applying the invention, but more simple in its construction than fig. 1. *a*, is a screw-nut, which screws into the barrel, but does not pass through into the chamber, there being a solid portion of the barrel below it, with the exception of an opening of such size only as to admit the piston to pass through it. The elastic material *g*, in this arrangement, is placed beneath the screw-nut *a*, and is pressed between it and the part of the barrel beneath it. The head *f*, of this screw-nut, together with its screw part *a*, receives the piston *d*, *e*, as in fig. 1, its whole construction and operation being substantially the same. The length of this piston is, under this arrangement, to be such as to extend across the chamber of the piece to be discharged. The small percussion cap is received on its inner end *e*, and this must be, as before remarked, somewhat smaller in diameter than the piston. These percussion caps are, in other respects, constructed in the ordinary way.

Any required number of these pistons, armed with their caps, may be conveniently carried, by arranging them in holes, prepared for their reception, in the stock or breeching part of the gun or pistol, or they may be disposed of in any way that will admit of their being readily applied when wanted.

Fig. 4, is a section through the touch-hole part of the breech or ventfield of a piece of ordnance, shewing the manner in which it is drilled, or bored through, for the insertion of the piston and exploding cap; and fig. 5, is the piston. *g, g,* is the part of the bore which is to receive the cylindrical piston fig. 5; and *h,* the lessened aperture, leading from the lower end of *g, g,* into the chamber of the gun; thus leaving a shoulder at *i, i,* against which the percussion cap is to be forced, when the discharge is to take place. At its lower end, the bore *g, g,* is made conical, to embrace the percussion cap at the time of the explosion. *l, l,* is a piece of cork, countersunk into the cannon, and having a hole in its centre, through which the piston passes; this cork is for the purpose of keeping the piston in its place.

In fig. 5, *n,* is a section of the copper cap, which is to be placed on the lower end of the piston *m.* This cap is perforated prior to its being charged with percussion powder; the opening being equal in size, or nearly so, to the perforation at *h,* fig. 4. The lower end *p,* of the piston, is turned down to receive the cap, and it is diminished in diameter at the part *q,* so as to leave a shoulder at *r,* above which the copper cap rises; and the upper edge of the cap is to be slightly bent inwards, so as to embrace the shoulder: this may be readily effected by holding a piece of steel, say one of the pistons, or a tool kept for the purpose, upon the edge of the cap, after it is in place, and rolling it over upon a table. By this means it is made to embrace the piston so firmly, as to ensure its being withdrawn with it after the discharge; whilst, without this precaution, it would be liable to be left behind. The dotted lines at *p,* show the perforation sometimes made for containing gunpowder.

The discharge is made by allowing a hammer to strike on the head *d,* of the piston; and this may be done by hand, but it will usually be effected by means of a lock, constructed in any convenient manner, and adapted to the piece to which it is to be applied.

The patentee states, that he may probably prefer to adopt a similar arrangement to the above in small arms; that is to say, to use a piston which shall not enter the chambers of such arms, but which shall be contained entirely within the tubular screw-nuts, represented in figs. 1, and 2, or tubular pieces analogous thereto. In this case, the perforated percussion cap, like those used for the discharge of cannon, will be employed, and the percussion powder will be allowed to pass therefrom into the chamber of the pistol or gun, through a perforation smaller than that which receives the piston. The whole arrangement of the apparatus being, in this case, substantially the same with that described as applied to cannon; the main difference being in the size only of the respective parts.

From the smallness of the openings through which the discharge is made from the percussion cap into the powder, forming the charge, or from the smallness of the section of the piston used in small arms, when the said piston is allowed to pass through the chamber, the reaction from the discharge, tending to throw the piston out, will be but small, and it will be held down by the force of the spring acting upon the hammer of the lock, when a lock is used.

When the piston is to be struck by hand, as is the case in ordnance, a button, attached to the ventfield of the gun, and bearing on the piston near its upper end, may be used for checking the rise of the piston from the force of the discharge. Fig. 6, shews the manner in which this button may be affixed; *d,* is the head of the piston, and immediately under this head there is a shoulder *r,* made by turning the shank of the piston, so as to form a neck smaller than the shank; *s,* is a steel button, which turns on a screw at *t,* and passes under a catch *u,* at its opposite end. The neck of the piston is embraced by the notch in the button *s,* and is thus held from being blown out. The neck is of sufficient length to give the requisite play to the piston, which can be drawn out when the button is turned back.

The patentee describes a third modification of his invention, in which the cap, as constructed and applied in the manner before stated, is dispensed with, and in place of it a cavity is made in the lower end of the piston, about the twentieth part of an inch in depth, and nearly as large as the diameter of the piston will admit of; leaving but a slender rim to receive and retain the fulminating powder with which it is filled, and which is further secured in its place by wax, varnish, or other means convenient for the purpose: this piston, when applied to small arms, is about 1-8th of an inch in diameter, and about 5-8ths, more or less, in length; and, for distinction sake, it is called the priming-cap. When this priming-cap is placed in the priming-tube or nut, preparatory to discharging the priming at its lower end, resting immediately over the vent, the instant it receives the blow of the cock on its upper extremity, the slender edge or rim retaining the fulminating powder gives way, bulging upwards; and as the matter ignites, and the intensity of its fire increases, the bulging of the metal also increases, so as to be capable of resisting any escape of fire, otherwise than by passing through the vent in the bottom of the nut or priming-tube into the chamber of the gun; whereas, in the ordinary mode in which the priming-caps are discharged, it is effected by projecting a nipple, or a slightly projecting fillet of metal, into their cavity, which allows, in most cases, the escape of one-half the fire generated; throwing off portions of the cap, to the imminent danger of the eyes, or otherwise creating dirt and dust about the lock and breech of the gun.

The nut or priming-tube, employed to receive, and to operate in combination with this priming-cap, is constructed in a similar manner to that shewn at fig. 1; but with this difference, that the cylindrical bore is not continued entirely through it, but only to about 4-5ths of its entire length, or to within an eighth or the sixteenth of an inch of its lower end, leaving a flat bottom for the priming-cap to rest upon; below which, a smaller perforation is continued, constituting the vent leading into the chamber of the gun. This vent is made conical, and terminates in the smallest possible point where it enters the chamber of the gun, by which means the return fire of the charge is cut off, as shewn in fig. 7, which is a section taken through the vent-hole. On applying these improvements to practical use, the nut or priming-tube is screwed into the breech of the gun; the priming-cap or piston is then introduced, and on being struck on its upper extremity by the cock of the lock, the cap is exploded, and the gun discharged. Fig. 8, is a sectional view of the several parts of this third modification: the parts being shewn detached to avoid confusion. Fig. 9, represents a section of the piston, shewing the recess, formed at the lower end thereof, for containing the detonating powder.

Sometimes, instead of the disc of leather or cork *g*, used for keeping the piston in its proper place, and preventing the escape of fire or smoke from the nipple, a small spring is attached to the nipple, for the purpose of pressing against the piston, and preventing it from falling out; or a burr may be raised upon the side of the primer, to effect the same object. This, if preferred, may of course be applied to either of the modifications above described.

The patentee's claims are as follows:—"I claim, as constituting my invention, the effecting of the discharge of fire-arms. Firstly,—by placing a percussion cap on the end of a cylindrical piston or rod, formed for the purpose, in the manner herein set forth; such piston, with its cap, being made to pass through an opening adapted thereto, either in the body of the breech of the piece to be discharged, or through tubular pieces, screwed into, or otherwise attached thereto; the said piston being of such length as shall adapt it to the respective modifications of my apparatus, as above described; that is to say, I claim the passing of such a piston through a tubular opening, allowing it to reach across the chamber, as in my first described modification. Or, I pass it into a cylindrical opening, extending nearly to the chamber, where a shoulder is formed by diminishing the size of the aperture, in the manner and for the purpose set forth; the respective parts concerned in the discharge being constructed, and operating substantially, as herein fully made known. I claim, likewise, the improvement in the percussion cap, consisting of the perforation through the middle of what is usually its closed end, in the manner and for the purpose described. And, Secondly,—I claim the method shewn in figs. 8, and 9, of applying, adapting, or containing the detonating powder in a recess formed at the lower end of the piston, on which the slender edge or rim, enclosing the fulminating powder, is made so thin, that on receiving the blow of the cock, it swedges upwards, and progressively giving way, as the matter becomes ignited, drives all the fire before it into the chamber of the gun, allowing none of it to escape; by which means, any accumulation of dirt or rust about the lock or breech is entirely prevented, insuring quickness and safety; at the same time, the fire being generated within the sixteenth of an inch of the magazine, and upon a level with it. And I also claim, as new and useful, the nut or priming-tube, fig. 8, made to receive and to secure the primer, containing the detonating powder, in its proper place, and from the effects of rain or moisture, and for the purposes hereinbefore set forth and described; but more especially do I claim as my invention, the priming-cap, constructed to operate in the way above stated, and acting in combination with the priming-nut or tube."—[*Inrolled in the Rolls Chapel Office, April,* 1841.]

To William Bedington, *Jun., of Birmingham, in the county of Warwick, manufacturer, for improvements in the construction of furnaces.*—[Sealed 10th July, 1844.]

The object of this invention is to cause the fuel to be better consumed than hitherto, and to prevent the discharge of a dark dense smoke from the chimney; it consists in the combination of a hanging-bridge, with an air-chamber, behind the ordinary fire-bridge of the furnace.

In Plate V., is a longitudinal section of a steam-boiler furnace, constructed upon this improved plan. *a,* is the boiler; *b,* the fire-bars of the furnace; and *c,* the ordinary fire-bridge. *d,* is a chamber behind the bridge *c,* which receives a constant supply of atmospheric air, in order that the air, ascending, may mix with the products passing from the furnace, and inflame them; the supply of air may be regulated by a valve at *f,* or by any other convenient means. *e,* is a hanging-bridge, by which the products passing from the furnace are deflected, and thus their mixture with the air, rising out of the chamber *d,* is facilitated: the position of the hanging-bridge may be varied.

Although this invention is only shewn applied to a steam-boiler furnace, it may also be applied to other furnaces.

The patentee claims,—the so constructing or arranging furnaces for steam-boilers and other purposes, as to combine the use of chambers *d*, and hanging-bridges *e*, beyond the bridges *c*, as above described.—[*Inrolled in the Inrolment Office, January*, 1845.]

To William Worby, *of Ipswich, foreman in the employ of Messrs. J. R. & A. Ransome, iron-founders and agricultural implement makers, of Ipswich, for improvements in the manufacture of bricks, tiles, and other articles, from plastic materials.*—[Sealed 24th June, 1844.]

The improvements in machinery for making bricks, tiles, and other articles, from plastic materials, which constitute this invention, are represented in Plate V. *a*, is the cylinder or tub of a pug-mill; *b*, a vertical shaft in the centre thereof, with a series of inclined knives *c, c,* projecting from it, as usual; and these knives, by the rotation of the shaft, are caused to "pug" the clay or other material, fed into the tub by the hopper *l*, and force it downwards. At the bottom of the tub *a*, four or any other number of small cylinders or chambers *d, d,* are fixed, having one or more openings in their sides, corresponding with similar openings in the side of the tub; so that when the clay is forced downwards by the knives *c, c,* it will issue from these openings into the chambers *d, d*: the size of the openings can be increased or diminished by raising or lowering a slide *m*, by means of the lever *n*. Each chamber *d*, is provided with a large opening at the bottom for the egress of the clay, with a dove-tailed recess *e*, beneath, for the reception of a moulding-plate, suitably cut for giving the required form to the clay, as it is driven out of the chamber by the piston *f*. The pistons *f*, (one to each chamber) are connected with their rods by ball-and-socket joints, and the upper ends of the piston-rods are connected also by ball-and-socket joints to a flat wheel *g*; this wheel *g*, rests upon a cross-bar *h*, at the top of the tub *a*, and has a conical hole in its centre, to admit of its assuming any required inclination, without interfering with the rotation of the shaft *b*, which passes through it. The shaft *b*, is turned by horse or other power, applied to the bar *i*, which is inserted in a box *j*, at the top of the shaft; this box carries on its under side a roller *k*, which bears upon the wheel *g*, in its circuit around the shaft *b*, and depresses to its lowest position, that portion of the wheel which it is at the moment passing over; consequently, the pistons *f*, being connected by their rods with the wheel *g*, will be successively raised and lowered, within their chambers *d*, *d*, and the clay will be admitted into and expelled from those chambers with great regularity.

The apparatus for cutting off and removing the moulded clay from the machine is not shewn in the drawing, as it forms no part of this invention.

Although the patentee prefers that the machine should be capable of pugging the clay, as well as to express it into the separate chambers *d*, yet, when the clay has been previously prepared, the pugging may be dispensed with; and the chamber *a*, will then only be used for keeping up a supply to the separate cylinders or chambers *d*, *d*.

The patentee claims, as his invention, the so arranging machinery, that a suitable pug-mill or machine shall have separate cylinders or chambers, each with a piston and moulding orifice, as herein described, combined therewith, by which a succession of bricks, tiles, or other articles, may be made, according to the nature of the moulding orifices applied to the cylinders or chambers.—[*Inrolled in the Inrolment Office, December*, 1844.]

To CHARLES HANCOCK, *of Grosvenor-place, in the county of Middlesex, artist, for certain improvements in cork and other stoppers, and a new composition or substance which may be used as a substitute for, and in preference to, cork; and a method or methods of manufacturing the said new composition or substances into bungs, stoppers, and other useful articles.*—[Sealed 15th May, 1844.]

THIS invention consists, Firstly, in manufacturing cork and other stoppers, and useful articles, of a composition formed partly of cork, or wood saw-dust, and partly of caoutchouc, or a vegetable extract recently introduced from the East Indies, called *gutta percha,* (and sometimes *gutta tuban*), or a mixture of caoutchouc and gutta percha, or a mixture of glue and treacle. Secondly,—in manufacturing cork and other stoppers, and useful articles, by connecting the above composition, when in the state of blocks or sheets, with similar blocks or sheets of caoutchouc, or gutta percha, or caoutchouc and gutta percha combined. Thirdly,—in manufacturing cork and other stoppers, and useful articles, partly of pieces of cork, and partly of pieces of the composition, or of caoutchouc, or caoutchouc and gutta percha combined; or wholly of pieces of cork, connected together by caoutchouc, or gutta percha, or caoutchouc and gutta percha combined, or some other suitable cement. Fourthly,—in manufacturing cork and other stoppers, and useful articles, by making the interior body of the article of cork, and coating it externally, either wholly or partially, with the composition, or with a mixture of ground cork and any suitable oil or varnish, or with caoutchouc, or gutta percha, or caoutchouc and gutta percha combined.

When the composition is made of cork and caoutchouc, the cork is rasped or ground to powder, and added, in suitable proportions, to the caoutchouc, which has been brought to a fluid state; the mixture is then transferred to moulds, of the size of the required articles, and left to solidify: if wood saw-dust is substituted for the cork, the same process is followed.

The gutta percha may be used (either alone, or combined with caoutchouc) in its native liquid state, or a solution of it may be obtained by the ordinary mode of dissolving caoutchouc; or instead of mixing the ground cork or saw-dust with the caoutchouc or gutta percha in a fluid state, the mixture may be effected by mastication, in the machines employed for that purpose by manufacturers of caoutchouc; the combined matters are then placed in large moulds (for the purpose of forming blocks, which are afterwards to be cut into stoppers or other articles), or in moulds of a proper size and shape for producing the required articles, and left to solidify. When glue and treacle are used, they are melted in a common glue-pot, and the ground cork or saw-dust being then added, the mixture is placed in moulds, as before.

Gutta percha may be made into sheets or blocks by the ordinary mode of treating caoutchouc; and sheets or blocks may also be made, in the same manner, partly of gutta percha, and partly of caoutchouc. The sheets or blocks, thus produced, are placed in a sheet-cutting machine, of the kind generally employed for caoutchouc, and cut into strips, which are again divided into pieces of suitable dimensions for the articles intended to be made.

In making articles partly of cork, and partly of the composition (or of caoutchouc, or gutta percha, or caoutchouc and gutta percha combined), the latter may be attached to the former either at top or bottom, or both; the cement preferred to be used for connecting the pieces together, is a solution of caoutchouc, or gutta percha, or the two combined.

To make stoppers wholly or chiefly of pieces of cork, the pieces are laid one above the other, and cemented together with a solution of caoutchouc, or gutta percha, or other suitable cement.

The patentee claims, Firstly,—the new compound or substance above described; and the employment of the same in any of the states, and according to any of the methods, aforesaid, in the manufacture of cork and other stoppers, and useful articles; confining his claim, as regards caoutchouc, to the use of the same in combination with gutta percha, or when alone combined with ground cork or wood saw-dust, for the purpose of being manufactured into cork and other stoppers. Secondly,—the employment of gutta percha, in any of the states, and according to any of the methods aforesaid, in the manufacture of cork and other stoppers, and useful articles. Thirdly,—the manufacture of cork and other stoppers, and useful articles, of common cork, cased or coated with the said new composition, or with a mixture of ground cork and any suitable oil or varnish, or with caoutchouc alone, or gutta percha alone, or with a mixture of caoutchouc and gutta percha; excepting, always, stoppers made of fibrous materials, in so far as regards the application thereto of caoutchouc alone.—[*Inrolled in the Inrolment Office, November*, 1844.]

To WILLIAM HIGHAM, *of Notty-ash, near Liverpool, in the county of Lancaster, plumber, and* DAVID BELLHOUSE, *also of Liverpool aforesaid, merchant, for improved constructions of boilers for evaporating saline and other solutions for the purposes of crystallization.*—[Sealed 6th June, 1844.]

THESE improvements in constructing boilers for evaporating saline and other solutions, for the purpose of crystallization, consist in so forming the boilers that the steam generated therein shall be retained, and the heat of such steam be applied to the evaporation of the solution to be crystallized; by which means, a great economy of fuel and labour will be effected, and the boiler being once filled with water, will seldom require a fresh supply.

In Plate V., fig. 1, represents the improved boiler, in longitudinal vertical section, and fig. 2, is a plan view of the same; fig 3, is a cross section taken in the dotted line of figs. 1, and 2. *a, a,* is the brick-work, for supporting the boiler or evaporating apparatus; *b,* and *c,* are the fire-place and flue, which are surrounded by the boiler *d, d.* The steam generated in the boiler *d,* rises into the chamber *e, e,* and, when at too great a pressure, it is allowed to blow off at the escape-valves *f, f.* *g, g,* is the evaporating pan, placed immediately above the boiler, and divided longitudinally by the steam chamber *e, e,* (see fig. 2). Fuel is supplied to the fire-place through the fire-door *h,* and the boiler is filled with water through the pipe *i.* *k, k,* are cocks, for ascertaining the height of the water in the boiler; and *l,* is a cock for emptying the same, when required.

In order to prevent the boiler from collapsing, when but a small quantity of steam is in the chamber *e,* there is a self-acting valve *f** (shewn in section, on an enlarged scale, at fig. 4), in connection with the escape-valve *f,* for admitting air into that chamber; and by this means, a pressure equal to that of the atmosphere is always preserved therein. When copperas or vitriol is to be manufactured, the evaporating pan *g,* must be lined throughout with lead, to prevent the action of the solution on the pan, which for other purposes may be made of iron or copper.

For the manufacture of salt, it has been found desirable to adopt the form of evaporating pan shewn at fig. 5; in this instance the top of the boiler *d*, forms the bottom of the pan, the sides of which are lined with wood. Under the bottom and sides of the boiler and steam chamber, a bed of saw-dust, or other substance which is a bad conductor of heat, is placed; and the whole is supported by brick or stone work, as shewn in the drawing.

Although a peculiar arrangement of evaporating apparatus is shewn, the patentees state that they do not confine themselves to that particular construction, as, instead of passing the flue directly through the boiler to the chimney (as shewn in the drawing), it may be returned under the same, and thus a greater heat and draft are obtained. The boiler may also be varied in shape from that shewn at either fig. 3, or 5, without departing from the principle of their invention.

The patentees claim the mode, above described, of retaining steam in the boiler, in which it is generated, for the purpose of applying it to heat and evaporate saline and other solutions; and lastly, the apparatus, above shewn and described, by which fluids generally may be evaporated.—[*Inrolled in the Petty Bag Office, December,* 1844.]

Specification drawn by Messrs. Newton and Son.

To THOMAS HARBOTTLE, *of Manchester, in the county of Lancaster, Gent., for an invention of a machine designed for manufacturing boot-soles, taps; and also for rivetting leather hose, traces, and for other purposes to which the same may be usefully applied,—being a communication.*—[Sealed 27th February, 1844.]

THIS invention consists in a novel arrangement of machinery or apparatus, designed principally for the purpose of inserting rivets into the soles, taps, or heels of boots and shoes, in order to economize the wear and tear; also for rivetting traces, leather hose, and for other similar purposes to which the same may be usefully applied.

In Plate VI., at fig. 1, A, is a strong horizontal cast-iron bed-frame, upon which a shaft B, is placed horizontally across its centre, supported in boxes C, C, on each side of the frame. From near the centre of this shaft project five cams D, E, E, E, E, one of which, D, represented detached at fig. 6, (which presents a vertical sectional view of shaft B, and the cams aforesaid) by its rotation actuates a plunger or driver F, which moves backwards and forwards lengthwise upon the bed A, and horizontally at right angles with the shaft B. One end of this driver F, passes through, and is guided by, the standard G, upon the bed. To the other end of the driver F, is secured a flat cast-steel cutter-plate H, (see also detached fig. 7,) which is fitted to slide close upon a horizontal plate I, of similar form, and is confined by an upper fixed cutter-plate J, placed at right angles over the moving cutter-plate, and through which is inserted a steel tube-cutter K, screwed into the fixed plate in a vertical position; this tube is tempered, and forms a female cutter, and may be screwed down as it is ground away (upon its lower end) in sharpening, or otherwise. The cutter-plate J, may be made with corresponding bosses, centrally upon its upper and lower surfaces, thereby forming an entire cutter-plate, (see fig. 7,) with set-screws and binding-screws at their ends, by which it may be brought down and regulated upon the sliding-cutter, as the bosses are ground away. This plate may be perforated with a sufficient number of holes, (for the cutting of one, two, or more rivets), which may be so situated that the said plate may be turned over, and end for end, by which means all the cutting edges or corners of the perforations may be used before it becomes necessary to grind the plate. Through the tube, in this plate, is entered the bottom end of the wire or rod A*, (see the enlarged view, fig. 5,) to be made into rivets, which rod also passes down through a hole, drilled in the sliding cutter-plate, and rests upon the bottom plate I, which forms a gauge for the length of the rivets to be cut. The cutter-plate should be bored out on its upper surface, (opposite the tube or tubes in the fixed cutter), so as to receive a steel disc or button, which should be square on its periphery, and nicely fitted into the recess, and about three-fourths of the thickness of the sliding cutter-plate; through the button cutter-holes are drilled (corresponding with those in the fixed cutter above), and this button-cutter may be reversed, and operate on either side up, or end for end; and, as it is reduced (by grinding) in its thickness, washers of thin metal may be placed underneath, thereby keeping it even with the surface of the plate in which it is inserted; or it may be raised by set-screws through the same, bearing on the bottom of the box aforesaid. In a line with the driver F, and directly over the cutter-plate, is placed what may be termed a rider L, which is moved horizontally backward and forward by a flange on the bottom of the cap M; which flange is secured to the end of the driver. Vertically in the rider, a hollow punch N, is placed, for punching the sole, &c.; there is also a solid punch O, for inserting the rivets in the holes made by the former. Directly underneath the lower ends of these punches is placed a stud or stake P, fig. 2, secured in the bed-frame, upon which the soles, &c. are punched, and the rivets driven by the said punches. Upon each side of the rider L, is elevated a standard Q, Q, between which, upon a fulcrum-pin, passing horizontally through the same, is supported a punch-lever R; the back end forming a forked lever, which is raised by the cams E, E, twice in every revolution of their shaft. On the side near the end of one of the forks of the punch-lever R, a pin or stud *f*, projects, which traverses in a groove formed on the inside face of an excentric *g*, which excentric is fitted around, secured to, and moves with, the shaft B. The groove in the cam, into which the pin *f*, projects, is so formed as to keep the bearing ends or forks of the punch-lever continually pressing upon the periphery of the cams, and the shaft B, alternately, when the same is in motion. Directly underneath the supporting-plate I, is placed a horizontal guide-wheel S, with a serrated rim or periphery, which ranges horizontally in a line with a space between the ends of the punches N, O, and the stake P, before described, which space measures about three-eighths of an inch. This guide-wheel is placed centrally upon the upper end of a vertical shaft, and is moved periodically by means of a ratchet-wheel T, upon the lower end of the same shaft. Into the teeth of this ratchet-wheel a pall *n*, catches, at each recession of the driver, before described, and thereby moves the sole, or other article to be rivetted, which being pressed by the hand of the operator against the toothed periphery of the guide-wheel, the required distances for the insertion of the rivets are obtained.

Fig. 2, represents a section, and fig. 3, an underneath horizontal view of the machine, and those parts which move the soles, &c., and regulate the distance of the rivets and rows apart, as seen in fig. 8, which represents a boot-sole, with the rivets inserted. The guide-wheel S, shaft, and ratchet-wheel T, (which may be made in one entire piece), are supported by, and turn upon, a pin, screwed vertically through a gauge-slide V, (see fig. 5).

This carriage is placed horizontally lengthwise, and centrally in the front of the bed A, through an opening in the same, under the stake P, and is supported in front by the flange or bracket *h*, on which it is made to slide backwards and forwards, and be fixed in any required position by means of the index-lever *i*; which, passing through a gap near the centre of the carriage, acts upon a fulcrum-pin *k*, and is funished, at one end, with a spur fitting into notches 1, 2, 3, in the flange *h*, (see fig. 1). On the gauge-slide V, (moving upon a fulcrum-pin W,) is placed a trip or lever X, in a horizontal position, with a light spring Y, upon its back, which forces the pall U, into the ratchet-wheel T, as before described; the end of the trip or lever X, is drawn back at each recession of the driver F, by means of the tumbler Z, which is made to play upon a pin or stud *a*, inserted in the end of the arm *b*; the said arm is secured to the under side of the front end of the driver F, by means of the ring-bolt and nut *c*, which passes through and binds together the cap M, the cutter-plate H, the driver F, and the arm *b*. The projecting end of the tumbler Z, is made to catch, in its backward and forward movements, the back end of the trip X, with a sufficient hold to produce the required throw of the pall U, and consequent movement of the ratchet-wheel T, and guide-wheel S, by which means the movement of the sole, or other article, is produced. The operator, holding the sole in one hand, as above described, gives motion with the other to the shaft B, by means of the crank *d*, or otherwise; the various parts of the machine moving and operating in the following order:—The first quarter revolution of the shaft B, raises the tail or forked end of the punch-lever R, by means of the punch cams E, E; which movement brings the forward end of the hammer of the punch-lever down upon the hollow punch N, making the required hole for the rivet in the sole or other article (the driver having been previously thrown back by its respective cam D), the wire or rod A*, previously described, falls into the hole in the cutter-plate H; the next quarter revolution of the shaft B, brings the cutter forward by means of the cam D, on that shaft; the cutter-plate H, at the same time, separates a rivet from the bottom end of the wire before described, and carries the same forward over the hole just punched in the sole, and the stake underneath the same. The rider L, is brought forward by the same motion, and with it the rivetting punch O, upon which the hammer or punch-lever R, now descends (by the impingement of the opposite cams E, E,) and forces the rivet from its position in the cutter-plate down into the sole, and clenches it firm in the leather, between the punch O, and stake P; by which means the rivet is expanded, and a partial head formed upon the inside of the sole, which is placed downwards when being rivetted: the whole is afterwards smoothed by rolling or hammering. The guide-wheel S, before described, is made to slide backward and forward with the carriage or gauge-slide V, in which it is supported, in order to gauge the sole for different rows of rivets.

Duplicate sets of punches may, if thought proper, be adopted; by which means both rows of rivets can be cut and inserted by the same motion of the machine, and in the same time required to fill one sole with a single set of rivets, as before described. The punches (whether one or more) should be raised by means of a stirrup or lifter *l*, supported pendant upon a pin through its upper end, which fits in a mortice, cut in the under front end of the punch-lever R. Two horizontal pins, one from each of the punches N, and O, pass through corresponding slots in the bottom end of the lifter *l*; by which means the punches are raised with and by the punch-lever, and are kept up alternately by spiral springs *m*, *m*, except when forced down by the lever aforesaid.

In addition to the manufacture of soles, taps, &c., by the above-described machine, it is applicable to the manufacture of leather hose, belts, traces, &c., where the seams or joints are to be made by rivetting. In the manufacture of leather hose or pipes, a horizontal mandril must be substituted for the stake P, around which the leather belt may be curved, and lapped directly under the punches aforesaid, bearing against the guide-roller, and thereby moved and graduated in the same manner as the soles, taps, &c., as before described. For the latter purpose, the point of the rivetting-punch should be formed into a blunt centre-punch, having a stake of similar form inserted, point upwards, directly underneath, in the upper surface of the mandril; by which means the ends of the rivets are sufficiently expanded to form the requisite heads; the rods or wire being of copper, previously passed through a fine screw-plate, or prepared in the same manner as those used for the improved soles.

The patentee claims, Firstly,—the combined forms of the cams D, E, E, E, E, as arranged upon the shaft B, in the manner and for the purposes hereinbefore described. Secondly,—the combined forms of the cam D, and shaft B, as shewn in the sectional view of diagram, fig. 6, the peculiarity of which consists in the uniform diameter of the shaft and cam, (when measured together through the centre of the shaft), which uniformity of diameter allows the friction-rollers *p*, *p*, (which have fixed centres in the said driver), to bear continually upon the opposite sides of the shaft and cam through an entire revolution of the same; and by means of which the driver is thrown backward and forward, and brought to two dead rests, while the shaft is making one revolution, which allows the two sets of cams E, E, immediately and alternately to perform their office upon the lever R, as before described. He also claims the following, as a separate and distinct combination of parts in the above specified machine, viz.:—The button-cutter *q*, as constructed, to be reversed in the different ways, and adjusted in the cutter-plate H, as above set forth, whether the same be circular or angular in its superficial form; and further, the combination and arrangement of the gauge-slide or carriage V, with the ratchet T, guide-wheel S, trip X, pall U, and tumbler Z, in the manner and for the purposes above set forth. Lastly,—the combination of the forms and adjustment of both the moveable and fixed cutter-plates H, and J, the rider Z, and punches N, and O, which conjointly perform the process of cutting the rivet, punching the hole, and inserting the rivet in the leather; whether the same be operated or set in motion by means of the shaft and cams before described, or by means of levers or otherwise.—[*Inrolled in the Petty Bag Office, August*, 1844.]

To SARAH COOTE, *of Clifton, near Bristol, in the county of Gloucester, for her invention of improvements in caulking ships, boats, and other vessels.*—[Sealed 24th July, 1844.]

THIS invention consists in substituting a different material to that at present in use for caulking ships, boats, and other floating vessels.

Under this invention the patentee entirely discards the use of flax or hemp, which are of a harsh and thready nature, and even when saturated with tar, will not produce a binding effect, for the materials may be entirely separated. The plan now proposed, is to employ fleece wool, shorn without washing, when it can be had in that state. This is to be subjected to a picking operation, which will have the effect of separating the fibres, and may be done expeditiously by women and children, near whom is to be placed a large shallow tub. Within this tub a strainer, made of netting wire or wood, is to be firmly fixed to a hoop or rim, only about one inch within the tub or cask; there must be bars across, and feet or short legs, about six inches, attached to this straining-frame, to keep it sufficiently high to affix a spigot and faucet into the tub. When a sufficient quantity of wool has been deposited in the tub, it is to be filled with a requisite quantity of thin white-lead paint, and then the wool and paint are to be stirred about with a proper fork, made for the purpose. After all this is properly done, and the superabundant liquor is drawn off by the spigot and faucet, fixed in the tub below the straining-frame, the saturated wool may be lifted from the tub by a hooked instrument, and put into buckets for use. A pair of crinkled plyers may be necessary, to take it out of the buckets on its application.

The patentee claims the employment of wool or hair, saturated with paint or pigment, for caulking ships or other vessels.—[*Inrolled in the Petty Bag Office, January*, 1845.]

Specification drawn by Messrs. Newton and Son.

To James Perkins Chatten, *of St. Martin's Court, Gent., for improvements in the manufacture of dead-eyes for the purpose of setting up the rigging of ships and other sailing vessels.*—[Sealed 22nd May, 1844.]

This invention consists in the application of a capstan and pulleys to dead-eyes, whereby ships' rigging may be expeditiously tightened, and with a less amount of power than heretofore required.

In Plate VI., figs. 1, 2, and 3, represent three variations of the new arrangement of dead-eyes. *a*, fig. 1, is the upper dead-eye, round which the shrouds are passed, containing six grooved pulleys; and *b*, the lower eye, which is attached, as usual, to the chain-plates on the ship's side, has four grooved pulleys, and two holes, *c, c*, for the reception of the lanyards. In this eye is also placed the capstan *d*, which is furnished at each end with ratchet-wheels and clicks, and in these wheels there are holes for the insertion of levers to turn the capstan. *e, f*, are two lanyards, which are "rove" into the dead-eyes in the following manner:—A knot being made at one end, its other end is passed through the hole *c*, and carried to the pulley 1, in the upper eye; it is then brought down to the pulley 2, up to the pulley 3, under the pulley 4, then over the pulley 5, and down to the capstan, where it is passed twice round the barrel, to prevent its slipping: the rove of the lanyard *f*, is effected in a precisely similar manner. When the rigging requires tightening, the ends of the lanyards are to be pulled; and if further power is found requisite, levers may be inserted in the holes of the ratchet-wheels before mentioned. Figs. 2, and 3, shew the upper and lower dead-eyes detached. The pulleys and the capstan run loosely on their respective axles, which pass through the block of the dead-eye. Fig. 4, represents a modification of the above; one lanyard only being employed; and the pulleys and capstan are also differently arranged, as will be seen in the drawing. *c*, is the hole against which the knotted end of the lanyard abuts. The third modification is shewn at fig. 5: the upper eye contains four pulleys, and the lower eye but two pulleys, instead of six and four, as shewn at fig. 1.

The patentee claims "the setting-up of the rigging of ships and other sailing vessels, by means of dead-eyes, constructed, connected, and worked in the particular manner, and according to the three varieties, hereinbefore described."—[*Inrolled in the Inrolment Office, November*, 1844.]

To William Elliott, *of Birmingham, button manufacturer, for improvements in the manufacture of covered buttons.* —[Sealed 4th June, 1844.]

This invention consists in so constructing and working the dies used for making buttons, that the dies which effect the covering of the front shell, and bring the parts of a button together, will also press the button into shape, so as to render its removal to finishing-dies unnecessary, except when the manufacturer employs two sets of finishing-dies; and, in that case, he is enabled, by the adoption of this invention, to dispense with the first set of finishing-dies.

The dies employed by the patentee (which are somewhat similar to those in ordinary use) are represented in Plate VI., at figs. 1. *a*, is the lower die; *b*, the upper die, or punch; and *c*, a tubular die, to be used with the punch *b*. The method of making buttons with these dies is as follows:—The covering material is laid with its face downwards upon the die *a*, and the front shell *d*, figs. 2, is placed on the punch *b*, which, descending, forces it, with the covering material, into the die *a*; when the punch is raised, the tube *c*, is introduced into the die *a*, and by this means the edge of the covering material is gathered over the edge of the shell *d*; after this, the back shell *e*, figs. 2, containing the shank, is introduced through the tube *c*, and the punch, again descending, forces the shank and back shell into the front shell, at the same time pressing the edge of the covering material into the front shell; the punch *b*, and tube *c*, then act as one die, and, descending, bring the parts of the button together, and press it into shape, as will be seen on referring to fig. 3.

Figs. 4, shew the dies used by the patentee for making what are termed "sewn through covered buttons," described in the specification of a patent granted to Humphrey Jefferies, April 22nd, 1841. *a*, is the lower die; *b*, the upper die, or punch; and *c*, the finishing die or punch. Buttons of the above kind are made with these dies, in the following manner:—The covering material being laid on the die *a*, the hollow ring *f*, (represented in plan and section at figs. 5,) is placed upon it, and they are forced into the die *a*, by the descent of the punch *b*; when the punch *b*, is raised, the punch *c*, is introduced into the die *a*, and the punch *b*, again descends, by which means the edge of the covering material is gathered over the edge of the hollow ring *f*, and the edge of the ring being at the same pressed into shape, shuts in the edge of the covering material, as will be best understood on inspecting fig. 6.

The patentee does not claim the use of the parts *a*, *b*, and *c*, separately, nor combined, when they are not arranged to work as above described. But what he claims as his invention is, the causing the parts *b*, and *c*, to be so arranged and worked, that, in addition to covering the front shell, and bringing the parts of a button together, they shall press the button into shape, as above described.—[*Inrolled in the Inrolment Office, December*, 1844.]

To Moses Poole, *of Serle-street, in the county of Middlesex, Gent., for improvements in the manufacture of paper, being a communication.*—[Sealed 10th July, 1844.]

This invention consists in preparing a pulpy matter from the broom plant, for making paper.

Any of the various species of broom may be employed for the above purpose; but the common broom plant is preferred by the patentee: it can be used either in a green or dried state, and may be subjected to a preparatory soaking in water, if found requisite.

The branches first undergo a violent crushing or beating, in any suitable machinery, by which the woody parts are rendered easily separable from the filamentous parts; and the former are submitted to a further process of grinding, before they are fit to be used with the filamentous parts. During the grinding or crushing process, the plant should be immersed in hot or cold water, (preference being given to a heat of 30° or 35° Reaumur), which should be constantly changed, and the operation continued, until it flows away colorless. The pulpy matter is subjected to great pressure, to force out the water, and is then acted upon by "a *lessive** of lime, with or without a quantity of soda, according to the quality of paper to be made;" after which it is thoroughly washed: care being taken to remove all the woody parts that float upon the surface. The pulp is then pressed again, divided into small parcels, and left until it is ready to be bleached; which may be effected by exposure to the action of chlorine, either in a state of vapour or liquid. If chlorine is used in a liquid state, it should be heated to about 25° Reaumur; and when the pulp has remained in it for about twenty-five minutes, an addition is made of one-eighth of a pint of muriatic acid for every hundred pounds of pulp; after which the pulp is allowed to rest for six hours, and it is then in a fit state for making paper.

The patentee claims the preparation and employment of a pulpy matter, obtained from the broom plant, for manufacturing paper.—[*Inrolled in the Inrolment Office, January,* 1845.]

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* The French word for ley or lixivium.

To Moses Poole, *of Serle-street, in the county of Middlesex, Gent., for improvements in the manufacture of oils, by using a material not heretofore employed, and in obtaining stearine therefrom, applicable in the making of candles; and also in the manufacture of manure from the residuum of such oils, with other matters,—being a communication.* —[Sealed 10th July, 1844.]

The patentee describes the above invention as consisting in the employment of oyster shells; firstly,—for improving the quality of certain oils, principally those obtained from beech or oak-tree flowers, from poppy seeds and flowers, and from grape seed, [query, *rape seed*]; secondly,—for improving the quality of candles; and thirdly,—for improving the quality of manure, and effecting a saving in the preparation thereof.

The mode of applying this invention in the manufacture of oil is as follows:—The oyster shells are washed, dried, and ground to powder; then, after the usual preparation of the oleaginous substances, and prior to putting them in the hair or lawn bags, they are powdered with as much oyster-shell powder as will be equal to about one-fifth of their bulk; when this is effected, they are put into the bags, and submitted to the action of the hydraulic press. The oil obtained is of two kinds, which are received in different vats; into each vat two pints of sulphuric acid are thrown, and the oil is well stirred, until it assumes a frothy appearance; the operator then throws in as much distilled water as there is oil in the vat, and, after stirring until it is covered with a white lather, allows it to rest for ten hours; the oil will then be at the top, the stearine directly beneath it, and the water and dregs at the bottom.

In concluding the description of this part of his invention, the patentee makes the following remarks:—"In the above fabrication, the mixture of the *faîne* to the *œillette*, in the proportion of two-fifths of the former to three-fifths of the latter, is already an improvement; but a greater one is the mixture of each of these two substances with the grape seed, in the proportion of one-half. The three substances can be mixed together, and the oyster-shell powder will, in each case, be added in the proportion before mentioned. Do not forget that, previous to the said addition, the oleaginous substance, prepared for the extraction of oil, is to be watered with distilled water, in the proportion of half a gallon per 2 cwt. of the oleaginous substance, and reduced into paste by means of a cylinder. Eight hundred-weight of this must produce twenty-five gallons of the best oil, four gallons of lamp oil, and fifty pounds of stearine."*

When oyster-shells are employed in the manufacture of candles, they are washed, and reduced to powder, which is converted into a white paste by the action of muriatic acid; this paste is warmed by steam, and introduced by degrees into the boiling tallow, stearine, spermaceti, or wax, in the proportion of forty per cent., being thoroughly incorporated with it by stirring: candles are made of this composition in the ordinary way. The patentee states, that the introduction of the oyster-shell powder gives to tallow candles the metallic or dry sound of wax, increases their hardness, and improves the color of the light.

The third part of the invention, viz., improving the quality of manure, is effected in the following manner:—Into the water and dregs, resulting from the manufacture of the oil, (as described in the first part of this invention), a quantity of soot is stirred; then the oil-cakes, remaining after the extraction of the lamp oil, are ground, and thrown in, together with the water and dregs proceeding from the leys of soap manufactories, the residual matters from tallow-melting and soap-making, and a large proportion of oyster-shell powder, which are stirred well together. "Let the whole ferment and dry, and afterwards get it ground, and you shall have produced a manure equal to the best guano."—[*Inrolled in the Inrolment Office, January*, 1845.]

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* This is evidently a bungling translation from a French description,—*faîne*, is the beech-mast, and *œillette*, is the vulgar name for the poppy.

To CLAUDE FRANÇOIS JULES PETIT, *of Regent-street, in the county of Middlesex, merchant, for improvements in fastenings for gloves.*—[Sealed 23rd January, 1844.]

THIS invention consists in fastening gloves upon the hand by the combination of a chain and studs, with a suitable holder, in such a manner that the drag of the chain on the holder will retain it in any required position.

In Plate V., fig. 1, shews a portion of a glove, furnished with the improved fastening; and fig. 2, is a representation, in plan, of the glove and fastening. On the wrist of the glove two studs *a*, *b*, are fixed; the stud *a*, carries a holder, (shewn detached, and on a slightly enlarged scale, at fig. 3,) having a forked end *c*, and an opening *d*, in it; and to the stud *b*, a chain *e*, is fastened, which is passed through the opening *d*, and a knob or other stop *f*, is then attached to it, to prevent it from repassing through the hole. To fasten the glove, the parts to which the studs are attached are caused to approach each other, by pulling the chain; and then, by pressing it down into the fork *c*, the chain is prevented from slipping back. The glove is unfastened by raising the chain out of the fork *c*, and thus allowing it to pass through the opening *d*.

The patentee does not confine himself to the exact shape of the various parts, so long as the peculiar character of the invention be retained; nor does he claim the separate parts of the apparatus.—[*Inrolled in the Inrolment Office, July*, 1844.]

To JOHN WHITEHEAD, *Jun., of Elton, near Bury, in the county of Lancaster, dyer and finisher, for his invention of certain improvements in the process of finishing fustians or beaverteens, satin-tops, and other similar cotton fabrics.*—[Sealed 15th August, 1844.]

THESE improvements in the process of finishing fustians or beaverteens, satin-tops, and other similar cotton fabrics, apply to every description of cotton goods (known by such general names in the trade), which require to be raised, or raised and "clothed," whether bleached, dyed, or printed.

In order that the distinct features of novelty in such improved process of finishing this description of cotton goods may be clearly understood, the patentee describes the ordinary method of finishing them. The method hitherto pursued has been, to take the pieces of goods in the "balk," that is, just as they come from the loom, and to perch them, or raise the fibres on the back of the cloth, commonly called "backing;" and to raise the nap or fibres on the face of the cloth, either by cards worked by hand, or by the ordinary raising machinery, and according to the finish required; repeatedly passing them through a stove, or before a brisk open fire, between the operations of raising. They are then submitted to either the operation of bleaching, dyeing, or printing, as the case may be; and lastly, when stiffened, they were finished off by the process commonly called reshearing, or "clothing," which is merely the getting up of the fibres previously raised before dyeing, &c., and cutting the nap or surface to the length required for the market.

The improved process, and the manner of performing the same, consists simply, in the first place, of submitting the goods to the operation of bleaching, dyeing, or printing (as required), in the balk, and afterwards raising the fibres or nap upon the back and face of the cloth; thus, as it were, reversing the ordinary process; and, when stiffened, the goods are to be reshorn, or clothed, and finished off, as before. By this improved means, a much more even surface and dye is said to be obtained, than can be produced by the common method, as well as more substance being retained in the cloth, the texture of which is less injured, and consequently there is less waste by flocks in the raising process; and the cloth, when finished, is more durable, and will present much fewer, if any, imperfections, either of make, dye, or finish, than when finished by the ordinary process.

The patentee remarks, that the only thing necessary to observe in this improved process, besides the above-described method of bleaching, dyeing, or printing the cloth, before raising the same, is, that after the goods have been dried in the ordinary way, after the dyeing process, they must be sufficiently "conditioned" or damped again, prior to raising. This state of the cloth can only be ascertained by experience, according to the strength or quality of the cloth, and the nature of the dye or color, and may be done by a variety of damping processes. In ordinary cases, it will be found, that hanging the cloth in a humid atmosphere, say twelve or fourteen hours, in a cooling shed, will answer the purpose; but the process most preferred is a damping-pit, that is, a chamber under the surface of the ground, constructed so as to give out sufficient humidity by having wet sand under the flooring, and arranged so as to admit or exclude the outward air, according as the state of the atmosphere is dry or humid; by which means more regularity, and a greater certainty, attends the operation of "conditioning," or damping the cloth, than otherwise.

The patentee claims the improvements in the process of finishing fustians or beaverteens, satin-tops, and other similar cotton fabrics, only as above described; namely, submitting such goods to the operation of bleaching, dyeing, or printing, as required, *before* raising the fibres or nap, and also damping or conditioning the goods (for raising) in that particular state, or so bleached, dyed, or printed, before raising the fibres or nap.—[*Inrolled in the Petty Bag Office, February,* 1845.]

Specification drawn by Messrs. Newton and Son.

To STEPHEN BENCRAFT, *of Barnstaple, Gent., for improvements in the construction of saddle-trees.*—[Sealed 9th June, 1842.]

THIS invention is an improvement in the construction of saddles, by attaching certain springs to the saddle-tree, for the purpose of affording elasticity to the seat; the object being to prevent the weight of the rider pressing upon the spine and ribs of the horse, by transmitting that pressure to the sides of the saddle-tree, and at the same time give the advantage to the rider of an easy seat.

The contrivance is simple, and will be readily seen by reference to two figures, shewing the saddle-tree, with the proposed improvement, in Plate V. Fig. 1, is a horizontal representation of the saddle-tree, that is, looking down upon it; fig. 2, a side or profile view of the same. *a, a,* is the wood-work of the saddle-tree, constructed as in ordinary saddles; *b,* is a steel spring lever, placed longitudinally, and attached at one end to the back part of the saddle-tree, which is its fulcrum; *c, c, c,* are three steel bow-springs, each being attached in the middle to the lever-spring *b,* and extending like ribs from the back-bone of an animal. The ends of these bow-springs or ribs bear upon the sides of the saddle-tree, or upon a piece of plate metal, affixed to the saddle-tree.

This is all the novelty proposed; and when the whole is covered and padded in the usual way of finishing saddles, the springs will afford that ease and elasticity to the rider, as the horse moves onward, which it is the object of the patentee to attain.

The invention is not confined to any one description of saddle, as it will apply equally to ladies' and other kinds of saddles, and is not in fact an improvement in the construction of saddle-trees, as expressed in the title, but merely a peculiar construction of spring, to be affixed to the seat of any saddle. The patentee says, " I claim the mode of obtaining elastic seats to saddles, by applying metal springs to saddle-trees, as herein described."—[*Inrolled in the Inrolment Office, December,* 1842.]

[The same effect has been proposed to be obtained by several patentees, viz., H. C. Jennings, Sep., 1823, by lateral springs, which, by binding against the sides of the horse, and sliding under the seat, allow the seat to rise and fall by the action and pressure of the rider,—see Vol. IX., of our first series; T. Marsh, May, 1824, (see the same Vol.), by coiled wire springs, placed under the seat, as is commonly practised in the seats of easy chairs; T. Taylor, May, 1836, by packing the seat with air-bags,—see Vol. XII. of our present series.—Editor.]

To Stephen Bencraft, *of Barnstaple, Esq., for improvements in the construction and fitting up of hames for the prevention and cure of galled shoulders to draught horses.* —[Sealed 3rd July, 1844.]

This invention consists in connecting the traces with the hames, in such a manner that the point of draught shall be opposite that part of the spine which forms the withers, and thereby allow of the free action of the fore-legs and shoulders. The patentee states, that this improved method of connecting the traces with the hames will not only prevent galled shoulders, but will also cure those arising from the use of hames fitted in the ordinary manner.

In Plate VI., fig. 3, represents a hame with the invention applied thereto. The trace *a*, has been hitherto fastened to the hame at the point *c*; instead of which it is now connected, by the strap *b*, with the upper part of the hame, and thus the point of draught is elevated, as above mentioned; *d*, is a strap that keeps the collar in its place, and assists the horse in going down a hill.

The patentee says, he is aware that it has been proposed to connect the trace with the hame by two, three, or more straps, but no beneficial effect has resulted therefrom, by reason of all the straps being fastened to the hame at the point *a*.

He claims, "the so applying straps or apparatus *b*, and *d*, to hames of horse collars, that the point of draught may be from the withers, as herein described.—[*Inrolled in the Inrolment Office, January,* 1845.]

To Arthur Powell, *and* Nathaniel Powell, *of Whitefriars glass-works, in the city of London, glass manufacturers, for improvements in the manufacture of quarries and other panes of glass for windows.*—[Sealed 30th July, 1844.]

In manufacturing quarries and other panes of glass for windows, the glass has been usually blown into globular or cylindrical forms, and these are flattened into sheets, out of which panes, of the required size, are cut; panes of plate glass have also been used for windows. Now, this invention consists in manufacturing quarries, and other panes of colored or uncolored glass, by means of moulds or dies and pressure; and forming them with plain surfaces,or impressing ornamental designs thereon.

The moulds or dies for impressing ornamental designs are cut in such a manner, that those parts of the quarry or pane, which are required to be darkest, shall be in relief, or of the greatest substance, and those which are to be light shall be sunk in the pane. The quarries or panes are made by placing a quantity of molten glass ("metal") upon the mould or die, which is then slidden under the flat surface of a fly or other press, and the glass is pressed into the recesses of the mould; thereby producing a plain surface on one side, and an ornamental surface on the other side of the quarry or pane. The quarry is now annealed, and, after having the outer or rough edges cut off, is ready for use.

The patentees claim, as their invention, the manufacture of quarries or panes of glass, with plain or ornamental surfaces, for windows, by means of dies and pressure, as above described.—[*Inrolled in the Inrolment Office, January,* 1845.]

REPORTS OF AMERICAN PATENTS.

From the "Journal of the Franklin Institute,"

EDITED BY DR. THOMAS P. JONES.

To ROBERT NELSON, *West Point, Tippecanoe county, Indiana, for an improvement on the compound shovel plough.*—[Dated 15th January.]

THIS is for the purpose of separating the ploughs, or drawing them nearer together. The outside ploughs of the gang are attached to a bar on each side of the beam, and jointed to it at the forward end, the back end sliding on a segment bar of iron projecting from each side of the beam. In this way, the ploughs which are attached to the back ends of the bars, can be drawn nearer to, or farther from, each other, this being effected by a hand lever having two arms (at right angles to the third arm, or handle), jointed by means of links to the back end of the two bars, by the turning of which, to any degree required, the distance of the ploughs can be regulated. At the back of the plough-frame there is a notched plate of iron arranged in a semi-circle, (called the " comb,") for the purpose of holding the hand lever at any point required. The claim is limited to the " combination and arrangement of the bars and lever, so as to effect the contraction and expansion of the cultivator, and, in combination with this, the iron comb."

To Meredith Mallory, *Mount Morris, Livingston county, New York, for a machine for cleaning grain, called the " centrifugal smut machine."*—[Dated 20th January.]

This machine consists of two discs, one permanent, and the other moveable, provided with several rows of teeth, commencing at about the middle of their semi-diameter, and extending to their periphery. The diameter of the rotating disk, which is the under one, is less than the upper or permanent one, which is provided with two or three rows of teeth beyond the periphery of the rotating disc. There is a fan attached to the shaft of the rotating disc, and the whole is enclosed by a conical case.

Claim.—" What I claim as my invention, and desire to secure by letters patent, is, the mode of scouring or cleaning grain, by causing it to pass from the centre of the revolving disc to its circumference by centrifugal force, said disc being armed with teeth, arranged and combined with an upper stationary disc, furnished with teeth, as set forth. I claim the arrangement and combination of these discs, and also, in combination therewith, the fans and curb, or casing, as described."

To Bennett Potter, *Jun., and* Abiather F. Potter, *Hubbardston, Worcester county, Mass., for improvements in machinery for making and finishing boat oars.*—[Dated 20th January.]

This is a modification of that kind of machine for turning irregular forms, such as gun-stocks, lasts, &c., in which the pattern acts on a guide-wheel, having its bearings on the same carriage as the cutter-wheel, which carriage has two movements, one longitudinal, to carry the guide and cutter-wheels from end to end, and the other transverse, to enable the guide-wheel to follow the irregular form of the pattern in both directions. In turning oars, which are necessarily of great length, it would be a matter of some difficulty to prevent the pattern from yielding when moving the guide and cutter-wheels. To prevent this yielding, the pattern is made in two parts, the round part being made permanent, as there is no necessity for its turning, the form in the direction of the circumference being regular, and the flat part or blade moveable: at the junction of the two there is a standard, which gives ample support, and is so arranged as to permit the guide-wheel to pass over as if it were a continuation of the handle part of the pattern. The moveable part is rotated by a mandril in the same manner as the piece of wood from which the oar is to be turned. There is a rest called "bearings," in the specification, attached to a carriage, connected and moved with the cutter-wheel carriage, whilst moving along that portion of the oar which constitutes the handle, for the purpose of supporting and steadying the wood whilst under the action of the cutters; but as these bearings cannot pass over the flattened part of the oar, at the end of the round part, the latch, which unites the two carriages, is liberated from a holding pin on the cutter-wheel carriage, and is there held until the cutter-wheel carriage returns, at which time the two are reunited, and travel back together.

Claim.—"We claim making the pattern, by which the oar is formed, or against which the guide-wheel acts, of two parts, in such manner, that one of the same, or that from which the handle is shaped, shall be stationary, while the other, or part which shapes the blade, shall revolve, the whole being as set forth. We also claim arranging the cutter-wheel and bearings upon separate carriages, for the purpose of arresting the action of the bearings during the operation of the cutters upon the blade part of the oars; the said carriages being connected together, and disconnected from each other by means of a latch and pins."

To JOSIAH COPELAND, *of Weymouth, Mass., for an improvement in the boot crimp.*—[Dated 20th January.]

WE have here a modification of that kind of boot crimp, extensively used in some portions of the country, in which the leather is stretched by a clamp that holds the corners of the leather, and is drawn out by a screw passing through a nut cut in it, and bearing in a socket in the back edge or heel of the form. In this modification the ends of the leather, instead of being clamped on the block, which is drawn out by the screw, are simply laid against the sides of the block, which has a pyramidal form, with the base towards the form, and over it is slipped a clasp, which has the sides of the same inclination, and notched or serrated: when the screw draws out the block, and stretches the leather, this draws the clasp still tighter, and, we are told, that the screw clamp is effectually superseded by this simple arrangement of the clasp.

Claim.—"I do not claim strictly the combination with a pyramidal frustum or block of another piece of metal forced down upon or over it by a screw or other contrivance, separate from the main straining screw, and for the purpose of confining the corners or edges of the leather between the said pieces of metal; nor do I claim the forcing of the two jaws or pieces of metal together by a screw, or other contrivance, separate from the main straining screw; but that which I do claim, consists in the manner, above described, of arranging the block and clasp, so that the turning up of the straining screw shall, at the same time, perform the double operation of confining the ends of the leather between the block and clasp, and of stretching the leather above the boot form; the whole being substantially as above specified."

To THOMAS C. THEAKER, *of Bucyrus, Crawford county, Ohio, for improvements in self-setting head and tail blocks, for setting the log on the carriage of a saw mill.*—[Dated 20th January.]

THE head and tail blocks, under this patent, as under many others that have preceded it, have a slide to which the dogs, &c., are attached, with cogs on the under side, into which the cogs of a pinion take, the arbor of this pinion being placed across the head or tail block, so that by the turning of the arbor the slide is moved to one side or the other. The arbor on both blocks has a segment of a cog-wheel on the end that projects outside the block, which is operated by a vertical sliding rack, and as the segment cog-wheel is connected with the arbor by a ratchet, when the rack is forced up, the arbor is rotated, which operates the slide to set the log, and, on its descent, the segment cog-wheel turns, and carries back the ratchet. On the tail block, the vertical rack is forced up by an inclined plane attached to the floor of the mill; but, as it is necessary that the head end of the log should be set quickly, and at the very time the saw passes out of the log, the vertical rack is forced up by a weighted lever, one end of which is jointed to a pitman, that passes through a hole in the floor, just under the position of the vertical rack at the end of the back motion of the carriage. The other end of the weighted lever is provided with a cord, that passes over a pulley, and is attached to a sliding hook, which is disengaged by a pin at the end of the back motion of the carriage, to liberate the weighted lever, which then descends, and forces up the pitman and vertical rack; the sliding hook being caught by the carriage at the end of the forward motion, to draw up the weighted lever to repeat the operation.

Claim.—" What I claim is the combination of the vertical rack which operates the slide, the pitman, and weighted lever operated in the manner substantially as set forth. I likewise claim the combination of the vertical rack, segment rack, (cog wheel) and ratchet wheel, operated, substantially, as set forth by the inclined plane."

To JOHN MILLER, *Lexington township, Stark county, Ohio, for an improved mode of setting the log on the carriage of saw mills.*—[Dated 20th January.]

THIS is for setting the tail end of the log, which is, to a certain extent, done in the same manner as in the preceding patent, except that the ratchet-wheel, on the end of the arbor, is actuated by a lever, instead of a segment cog-wheel and vertical rack. This lever, instead of being moved by coming against a single inclined bar to move the slide, comes against a succession of inclined blocks jointed to the floor, so that the log is set by a succession of small movements instead of a long one. The inclination of the blocks can be regulated at pleasure, by means of wedges that pass in between them and a bed timber, designated by the letter T, in the claim, and at the end of this series of blocks, there is an inclined piece of timber, designated by the letter U, which conducts the end of the lever over the end of a long spring, to enable it to run back without being caught by the inclined blocks.

Claim.—"What I claim as my invention, and desire to secure by letters-patent, is, making the guide-blocks in sections, so as to set the log by several operations of the lever acting on the ratchet-wheel, instead of one operation, in combination with the timbers T and U, and the spring V, the guide-blocks being regulated by wedges, or other analogous devices, all as herein described."

To THOMAS H. HOSKINGS, *of Crawfordsville, Montgomery county, Indiana, for an improvement in the planting plough.*—[Dated 20th January.]

THE patentee says,—"My machine for planting corn is to be so formed, that it may be attached to the common plough, for which purpose it has a projecting arm extending forward, through the end of which a joint pin, or bolt, passes, by which it is so connected with the plough as to keep it in its proper position. The machine has a single wheel which runs in the furrow made by the plough, and on one side of the wheel there is a hopper for containing the corn. A pin on one face of this wheel is brought into contact with a lever which raises a slide on one side of the hopper, and allows the grain to drop out once in every revolution of the wheel. The distance of the hills from each other will be determined, therefore, by the diameter of this wheel."

"What I claim is, the manner in which I have arranged the respective parts of the said planting machine, so as to connect it with the common plough by means of a joint pin, allowing it to be attached to such plough between the handles, and to be detached at pleasure, in the manner, and for the purpose, set forth."

Scientific Adjudication.

COURT OF EXCHEQUER.

January 11, 1845.

HEATH *v.* UNWIN.—JUDGMENT.

THE question of the infringement, by the defendant, of part of an invention described under letters-patent granted to the plaintiff, April 5, 1839, for "certain improvements in the manufacture of iron and steel," has already been the subject of two trials. The first action was tried during the sittings after Trinity Term, 1843, before Lord Abinger, and the plaintiff was nonsuited; but he afterwards obtained a rule for a new trial on the ground that his Lordship had misdirected the jury. The second action was tried during Trinity Term, 1844, before Mr. Baron Parke, and a verdict returned for the plaintiff on all the issues; but leave was given for the defendant to move to enter a verdict in his favour on the first issue; which was, Whether, this being a patent, there had been an infringement of it by the defendant. Accordingly, an application was made for a rule to enter a verdict, on the plea of not guilty, for the defendant; or for a new trial for misdirection; and this was argued during the last term.

This day Mr. Baron Parke delivered the judgment of the Court.—This case was argued before my brothers Gurney, Alderson, Rolfe, and myself, during the last term, on shewing cause against a rule to enter a verdict, on the plea of not guilty, for the defendant; or for a new trial, for misdirection. As we are all of opinion that there was no infringement of the plaintiff's patent, and, consequently, that a verdict should be entered for defendant, it becomes immaterial to consider the other questions raised. The plaintiff, in the year 1839, obtained a patent for certain improvements in the manufacture of iron and steel, and in his specification he mentions several; but the question arises upon the claim to the use of carburet of manganese in any process whereby iron is converted into steel. The specification, after mentioning the use of oxide of manganese (the description of another part of his invention), proceeds to describe the part of the process alleged to have been infringed, in these terms:—"Lastly, I propose to make an improved quality of cast-steel, by introducing into a crucible bars of common blistered steel, broken as usual into fragments, or a mixture of cast and malleable iron, and carbonaceous matters, along with from 1 to 3 per cent. of their weight of carburet of manganese, and exposing the crucible to the proper heat for melting the material, &c.; but I do not claim the use of any such mixture of cast and malleable iron, or malleable iron and carbonaceous matter, as any part of my invention, but only the use of carburet of manganese, in any process for the conversion of iron into cast-steel;" and in summing up his claims, he states one of them (the third) to be, the employment of oxide of manganese alone in the puddling of cast-iron; and the fourth (the one in question) to be the employment of carburet of manganese in preparing an improved cast-steel. This substance is metallic, and formed by the fusion of black oxide of manganese with carbonaceous matters. Upon the trial it appeared, that the defendant never used carburet of manganese, by putting any of that substance into the crucible; but he placed the black oxide and carbonaceous matter together in the crucible; and some scientific witnesses, who were examined, gave their opinion that these two substances would form, during the process of conversion, and before actual union with the melted steel, carburet of manganese, in a state of fusion; and the jury found that supposition to be true; but also found that the quantity of carburet so formed would be less than 1 per cent. of the weight of the steel in the crucible. Upon these facts the question arose, whether the defendant was guilty of an infringement of the plaintiff's patent? In order to decide this, we must first determine for what invention the patent, as explained by the specification, is taken out. It is not for the use of oxide of manganese in the melting of cast-steel, for carburet of manganese is expressly mentioned, and distinguished from oxide of manganese; nor could the patent for the use of the oxide have been supported, as that substance had been used long before in the process of melting steel; nor is it for the use of oxide of manganese in any mode of combination with carbon generally; if it had been, it would be liable to a similar objection, as oxide of manganese had been used in crucibles containing in their construction a quantity of carbonaceous matter, with a portion of which it would necessarily combine during the process; nor is it for the use of the oxide with such a quantity of carbon as would de-oxidate it, and leave the manganese alone to operate upon the steel, so that neither the quality of the steel be altered, nor the crucible destroyed, by the oxide of manganese abstracting, as it otherwise would do, some quantity of carbon from them. The patent is obtained for the use of one peculiar combination of carbon and manganese, the metallic substance called carburet of manganese, and for the use of it in that state. The specification is expressly for the employment of carburet of manganese; and the mode of using it is, by putting a certain quantity, by weight, of that substance, in an unmelted state into the crucible. This being, in our opinion, the true construction of the specification, it is clear that the defendant has not directly infringed the plaintiff's patent, for he has never used that substance in the mode described in the specification. Then comes the question, whether he has indirectly infringed the patent, by imitating and using the same process substantially, but making a colorable variation? Now, there is no doubt, we think, if a defendant substitutes for a part of a plaintiff's invention some well-known equivalent, whether chemical or mechanical, he would probably be considered as only making a colorable variation. But here he has not done so. It is quite clear upon the evidence, that the defendant never meant to use the carburet of manganese at all; he certainly never knew, and there is no reason to suppose that, prior to the investigation, any one else knew, that the substance would be found in a state of fusion—and it is mere matter of speculative opinion (though after the verdict we must assume it to be a correct opinion) amongst men of science that it would; but it was clearly not ascertained, and still less was it a well-known fact. There was, therefore, no intention to imitate the patented invention, and we do not think the defendant can be considered to be guilty of any indirect infringement, if he did not intend to imitate at all. In this view of the case, it becomes unnecessary to consider the other questions which were argued—and we all think the rule must be absolute to enter a verdict on the first issue for the defendant.

COURT OF COMMON PLEAS.

Sittings in Banco, Jan. 22, 1845.

STOCKER *v.* WARNER AND ANOTHER.

This was an action for the infringement of a patent granted to the plaintiff on the 4th of March, 1837, for "improvements in pumps;" and the declaration, after setting out the grant of the letters-patent, and stating that the specification was duly enrolled within six calendar months afterwards, proceeded to allege, that the plaintiff, on the 5th of March, 1844, filed a disclaimer of part of such specification, and also altered the title of the patent, by calling it a patent for "an improvement in fixed lift-pumps." The declaration then complained of a subsequent infringement by the defendants. The defendants pleaded, that before the entering of the disclaimer and memorandum of alteration, viz., on the 5th of August, 1840, a patent was granted to one William Beetson, of Old-street-road, for "improvements in water-closets and stuffing-boxes, applicable to pumps and cocks;" that the defendants had Beetson's licence to use his invention; and that under that licence they had made, used, and sold articles which were the subject of the alleged infringement. The plaintiff demurred specially to this plea, on the grounds of uncertainty and argumentativeness.

Sir T. Wilde, in support of the demurrer, said, that the answer which the plea professed to set up was, that the plaintiff's patent was void until the entry of the disclaimer, and that, as the patent granted to Beetson was obtained before the disclaimer was entered, his patent being taken out for the same invention as the plaintiff's, would make the plaintiff's patent void. He submitted, however, that the effect of the statute of the 5th and 6th of William IV. c. 83, was to make the disclaimer retrospective. The disclaimer was, in fact, in the nature of an amendment, and that such was the intention of the Legislature was evident from the provision, that caveats might be entered against any disclaimer or alteration, and that no such disclaimer or alteration should affect actions pending at the time when such disclaimer or alteration was enrolled. But, even supposing the plaintiff's patent was void, the plea neither alleged that Beetson's patent and the plaintiff's were for the same thing, nor that the plaintiff's patent was bad, in distinct terms. It only stated argumentatively that the plaintiff's patent was void because the patent granted to Beetson was good. The mode in which the infringement was attempted to be answered was also open to the same objection.

Mr. Serjeant Byles (with whom was Mr. Webster) appeared for the defendants, and contended that the plea was good in substance and in form; and also that, even if defective in point of form, the faults in the plea were not pointed out by the grounds specially assigned as causes of demurrer.

The Court, however, after hearing Sir T. Wilde in reply, unanimously decided that the plea was bad, being of opinion that, after the disclaimer was entered, the patent granted to the plaintiff was valid from the time of the original date of the patent, and therefore Beetson's patent would be avoided at the date of the disclaimer.

Judgment for the plaintiff.

[This very pointedly establishes the utility of a disclaimer. By inattention to the meaning of the clause of the act, many have erroneously supposed, that they could found a good patent upon a useful part contained in an existing patent that is obviously invalid. There are two things against establishing such a claim; firstly, that the inrolment of the specification of a bad patent, necessarily gives publicity to the whole matters contained in it; and secondly, that the first patentee can right himself by disclaiming the bad part of his specification, and so make his patent valid.—EDITOR.]

POLICE COURT, MARLBOROUGH-STREET.

Before J. Hardwicke, Esq.—Feb. 15, 1845.

KENNEDY AND ASPREY *v.* COOMBS AND FINLAY.

THE information set out that the complainants were proprietors of a registered design for "an improved portable ink and light box," bearing date August 27th, 1844, and charged the defendants with having sold, within 12 calendar months, an article of manufacture to which the said design was applied, well knowing that the consent of the proprietors of the said design had not been given to such application thereof.

Mr. Simons, on behalf of the complainants, stated, that they were the proprietors of a new and original design for improved portable ink and light boxes, which was duly registered, August 27th, 1844, under the act 6 & 7 Vict. c. 65. He stated that the improvements had for their object a mode of raising the lid of the box when fitted into writing-desks or travelling-cases, without removing the box from its seat, which could not be done with ink and light boxes of the ordinary form and construction. The improvements were effected by altering the form of the lid by raising the hinge, so that, when the box was open, the lid might not project beyond the back of the box; and by placing a spring bolt in the lid, which being drawn back, the lid of the box would fly open as usual.

The learned gentleman went on to state, that the defendants had made and sold an ink box, which was in substance the same as that registered by complainants; the slight difference between the two amounting to a mere colorable variation, for the purpose of evading the protection.

Witnesses were then called, to prove the sale, and the similarity of the two articles. The sale was proved by a lad in the employ of Mr. Evans, of Berwick-street, Oxford-street, who went to the establishment of the defendants, and ordered an ink box, which was sent home. This witness produced the ink box, and the invoice for the same.

The next witness, who was a maker of portable ink and light boxes, on looking at complainants' box, deposed, that he saw no difference between it and that sold by defendants. In both, the joints of the hinge were placed high, and had the same action. He was aware of the form of former boxes. They were all different from the registered one, as respected the hinge joint. This witness, on his cross-examination, admitted that the two boxes, *as to form and shape*, were similar to several old boxes produced by the defendants; but alleged that he never saw any with the same action before complainants'. The advantage consisted in the lid being capable of opening without projecting beyond the back of the box. They would be of no use without a catch at the top. Complainants' sliding catch was new, as applied to this purpose. Its mechanical action was good.

Mr. Webster, on behalf of defendants, intimated to the Magistrate that he was prepared to submit many objections to the information, but, without going into them, he submitted that the complainants' own witness had furnished a good answer to it. His evidence went to prove, that the alleged novelty or originality of complainants' design, was more in the nature of a mechanical contrivance than a *new* design *in shape or configuration*. He contended that both articles were alike in this respect, and answered the same purpose. That mechanical action is not a subject for registration, and can only be protected by a patent. The act 5 & 6 Vict. c. 100, gave protection, by registration, to designs for articles which were purely ornamental. The act 6 & 7 Vict. c. 65, extended the same protection to articles having reference to some purpose of utility, so far as concerned the shape or configuration; such, for example, as a change in the shape of a lamp glass, which might serve a purpose of utility.

The Magistrate (looking at complainant's design, and comparing it with the old box).—I see no fresh design—no alteration in shape. The object is, a more correct mechanical action. There is no design whatever.

Mr. Simons.—A purpose of utility is sufficiently shewn, as explained by the witness to result from the change of configuration.

The Magistrate.—The shape is the same as formerly. Comparing the two, can any human being predicate any novelty or originality of design? At present, I entertain a strong opinion against such a view. (After reading the words of the 2nd sect. of the act 6 & 7 Vict. c. 65.) The articles are nearly the same, except, for a particular use, there is a slight change of mechanical contrivance. I entertain a very strong doubt as to novelty of design, for the purposes of these proceedings. There is no combination of lines shewing originality. Where is there a difference of outline, shewing newness of combination? I must therefore dismiss the information, but without costs.

UNITED STATES (N. AMERICA) CIRCUIT COURT.

EMERSON *v.* HOGG AND DELAMATER.

This was an action for an alleged infringement of a patent granted to the plaintiff for a submerged wheel, with spiral paddles, intended to propel vessels. The defendants conduct the Phenix Foundry, in the city of New York, and had fitted various vessels with "Ericsson's propellers." The principal question in the cause was, whether these propellers, claimed to have been patented by Mr. Ericsson, were substantially the same as the wheel patented by the plaintiff.

The plaintiff, Mr. John B. Emerson, produced and read to the Jury a copy of his letters patent, dated 8th March, 1834.—He proved, by Dr. Jones, that, at the time of filing his specification, he deposited in the Patent Office a drawing of the wheel, and also a model. The original specification, drawing, and model, were destroyed by the fire which consumed the patent office in December, 1836.

The counsel for the plaintiff then produced and offered to read a certified copy of a drawing made by the plaintiff, and filed in the Patent Office on the 28th February, 1844; this was objected to by the defendant's counsel, on the ground that the specification did not refer to any drawing, and that none had been annexed thereto—this objection was overruled, and the drawing was put in evidence.

The deposition of Dr. Jones, of Washington, was then read, by which it appeared that the plaintiff came to that city in March, 1844, and had with him the model of his improved wheel; that Dr. Jones was consulted by him, and then advised him that the drawing filed in February was imperfect, and an inaccurate delineation of the wheel; and that thereupon Dr. Jones prepared a new drawing, with references, which was sworn to by Emerson, and filed on the 27th March, 1844. The counsel for the plaintiff then offered to put this corrected drawing in evidence. The counsel for the defendants objected, upon the ground that the Commissioner of Patents had no right to receive and file more than one drawing, and that by the filing of the drawing made by Emerson in February, the power conferred by the Act of 1837* had been exhausted. The Court overruled the objection, and the second drawing was put in evidence.

The counsel for the plaintiff then produced the model of a ship, with the propeller wheel, patented by the plaintiff, and then read the deposition of Charles Robinson, who deposed that he had made the said model in the year 1837, in New Orleans, and that it had been publicly exhibited, for a year, in the Merchants' Exchange of that city, and from thence was taken to the plaintiff's ship yard.

The plaintiff's counsel then called William Serrell, who testified that he was a civil and mechanical engineer. Being shewn models of the plaintiff's wheel, and of Ericsson's propeller, he stated that he had examined them, and had been forced into the conclusion that they were essentially the same.

This witness was subjected to a very long and minute cross-examination, which strongly exhibited his accurate and scientific acquaintance with the principles of practical mechanics. He stated, in substance, that the two machines were substantially the same in mechanical construction and action; that he could construct the plaintiff's wheel from his specification. He went into a detailed explanation of the specification, and said, that, taking it as a whole, he considered it sufficiently disclosed that which the inventor intended to construct.

The plaintiff's counsel also called James P. Allaire, who testified that he had been engaged for many years in making steam engines and other machinery; that "Ericsson's propeller" was identical in mechanical construction and effects with the plaintiff's wheel. He examined the specification, and testified that he could from it construct a wheel similar to the models produced in Court.

John C. Kiersted testified that he was a practical mechanic, and that, taking the specification, with either of the drawings filed by Emerson, he could construct a wheel similar to the models. He also proved that the defendants had made and applied "Ericsson's propellers" to a large number of vessels.

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* See the American Patent Laws at p. 222, Vol. XXII. of our present Series.

Stephen E. Glover testified that he was acquainted with Ericsson's propeller; that he had been interested in his patent, and that the charge for the use of his propeller was three dollars per ton for large vessels, and two dollars and fifty cents per ton for those of a smaller class.

The counsel for the defendants admitted that they had applied "Ericsson's propellers" to six vessels, each of 150 tons, and to one vessel of 340 tons.

The counsel for the defendants then called Dr. Dionysius Lardner, who testified that, before the date of the plaintiff's patent, he had seen propellers in England which had been patented by Mr. Perkins, and also by Mr. Smith. Models of them were produced, but the witness admitted that they differed substantially from the plaintiff's. He testified that the specification was vague and indefinite, and that he could not, from its directions, construct a wheel such as the plaintiff claims to have patented.

The deposition of Charles M. Keller was then read. He testified that he was a clerk in the Patent Office; that he had officially examined the two patents of Emerson and Ericsson; that, in his opinion, they were different, and did not conflict; and that he had made a report to that effect to the Secretary of the Treasury.

James J. Mapes and William A. Cox testified that they were consulting engineers, and that they had read the plaintiff's specification; that it was vague and indefinite, and that they could not, from its directions, construct the wheel claimed by the plaintiff. Upon cross-examination, these witnesses stated that they were not practical mechanics.

Joseph Belknap, a draughtsman in the employ of Dunham &Co.; James Cochran, second engineer of the steamer Princeton; and George Birkbeck, jun., a person in the employ of the defendants, stated that they could not, from the specification alone, have constructed the wheel; but that, with the aid of the corrected drawing made by Dr. Jones, they could have done so.

The Court charged the jury, that the patentee is bound to file a specification of his discovery, which shall apprise the public of his invention without ambiguity or uncertainty; that, if they shall find that the plaintiff originally filed drawings, so that all persons might have examined them, and that such drawings were similar to those produced in the trial, then they might come in aid of the specification. He directed the jury to view it as the whole specification, and gather from it what the plaintiff intended to claim. His Honor then examined the terms of the specification in detail, and reviewed the testimony of the witnesses. He instructed the jury, that they must construe the language as addressed to men skilled in this branch of art—and if a competent mechanic could, from it, have constructed the wheel, it is sufficient. If such a mechanic could not, from the specification, have constructed the machine, then the plaintiff must fail, unless he can help it out by the drawings; that these must be shewn to have been filed with his original application; that in this case, the Patent Office and its contents having been destroyed by fire, he is compelled to supply the evidence in the best way he can. The Judge then reviewed the evidence as to the drawings filed in 1844. He further instructed the jury, that it had been contended that Emerson had abandoned his patent to the public by non-use; that this might arise either from positive abandonment, or might be implied from circumstances—and if the jury should find that he had relinquished his right, then he could not maintain this action; that a patentee cannot lie by an unreasonable time, and allow his invention to go into use. The Judge then reviewed the evidence upon this point.

He further charged, that it did not appear to be denied, that if the plaintiff's patent was valid, that the defendants had infringed it; that the jury were bound, if they found in favour of the plaintiff, to give him a verdict for his actual damages; that in some cases the Court had instructed the jury, that they might, in addition, give damages to compensate the plaintiff for the expenses of the litigation—but that, in the present instance, he thought they ought not to find beyond the actual damages proved. He repeated, that the great question in the cause was, had the plaintiff established his right to the wheel commonly known as "Ericsson's propeller?"

The jury found a verdict for the plaintiff for 3,575 dollars and six cents, costs. It is stated that, of the jury, eight were practical mechanics.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from Vol. XXVI. page 46.)

In the case of the first slip at New Cross, this movement was materially assisted by the natural dip of the strata from west to east, and by the fact of the western slope being on the inside of the curve, thus leaving the slope less supported laterally.

This slip has been ascribed, in some degree, to chemical action, which, although not the only cause, nor, it is presumed, the most effective one, may probably have assisted the action of water. The lower part of the yellow clay and the upper part of the blue clay, abound in pyrites; this is decomposed by the action of the weather, and the sulphuric acid disengaged, enters into combination with the carbonate of lime, which is found with septaria, thus forming crystals of selenite, which here exist in great quantities.

The act of crystallization, while it alters the bulk of the component materials, may be supposed, in a measure, to assist the separation of the clay; in fact, the innumerable breaks or faults in this soil, are found to be covered with the crystals in minute flakes or spiculæ, between which the water would have a clear passage.

From this consideration of the causes of the movement, and the account of the manner and extent of the slips themselves, the author proceeds to notice the various modes of treatment which have been adopted, both at New Cross and elsewhere, under the instructions of Mr. Cubitt (V.P. Inst. C.E.), the consulting engineer of the Croydon railway.

Since the slip of November, 1841, above 250,000 cubic yards of clay have been removed from the two sides of the New Cross cutting, at the precise place where the slips took place. By the aid of the Inspector-General of Railways, the Company has been enabled, by obtaining possession of the necessary ground above, to trim back the slopes to what is considered a safe position. This has been done in the form of benches and intermediate slopes; on the west side the slope is divided into four parts by three benches, and on the east into three parts by two benches. These benches vary in dimensions up to 65 feet in breadth, and are so arranged, that they leave the least heights of slope at the bottom, near the railway, and the greatest heights near the top; these slopes being generally at the inclination of about 2 to 1. This arrangement, although not a curve, brings the general form of the whole slope into accordance with the conditions previously alluded to. Drains are formed in the benches and slopes, to carry off the surface water, and although some slight slips have taken place, there is now no further symptom of greatly extended movements.

The same nature of clay in which this slip took place, is found in all the cuttings of the Croydon railway; in some places it is of a more solid character, while in others, as at Forest Hill, it is very silty and untractable. So pervious, indeed, is the soil at Forest Hill, that after much rain it runs into mud; and after in vain attempting a complete system of under drainage or soughing, by means of horizontal drains round and through the bottom of the slip to the face, and vertical drains from the top down to the back drains, a wide bench was cleared, about 20 feet up the slope, and varying up to 70 feet wide, by running upwards of 100,000 yards of clay to spoil; and at the back of the benching a retaining wall of gravel, varying from 5 feet or 6 feet, up to 10 feet or 12 feet in height, and nearly double the same dimensions in width, was formed, with a good footing into the solid earth below, to support the slipping earth behind. The clay taken out to form this wall was thrown up in front of it for additional weight; and although the earth is still in some degree slipping away at the top, the foot has remained firm, excepting once, when a slight movement was perceived, and was immediately stopped by building in two gravel buttresses 12 feet wide, from the weak point down to the bottom of the slope.

Other slips have occurred in the cuttings and embankments, the greater number of which were treated in the following manner:—Parallel trenches were cut completely through the slip from top to bottom, finishing in the solid earth behind, care being taken to cut footings in the soil perpendicular to the face of the slope. The opening thus prepared was filled with gravel rammed in tight, in some cases with gravel and clay mixed, a rubble or bush drain being previously laid in from the back to the front. The thickness of this gravel buttress was from 6 feet to 12 feet, according to the size of the slip, and the same circumstance regulated the distance between the buttresses, which were united and mutually supported at the foot, by a retaining wall or footing of gravel running the whole length of the slip; the top of the slip was pounded tight, and the face trimmed off. This plan has been perfectly effective, at once supporting and draining the slip, while it was a far less expensive method than removing the slip and trimming back the slope, and avoided the necessity of so many obstructions to the traffic of the railway, which would have occurred in removing the spoil along the main line.

Water, in these and most other cases, appeared to be the ultimate cause of all the slips; the drainage, therefore, of the slopes, as recommended by the author, in both cuttings and embankments, is a consideration of the utmost importance; and where, as in the system above named, it can be united with a means of opposing weight to weight, it may fairly be presumed that the cure is permanent and complete.

Mr. Cowper said, that he should be inclined to attribute the slips to the expansion of the clay from the action of water. He had recently examined the retaining walls on the London and Birmingham Railway, in the cutting near the Euston-square station, and had found they were, in several places, forced forwards, apparently by some action behind them. This action was irregular, for its effects appeared indiscriminately at the top, at the bottom, and in the middle of the retaining walls, which were built of brick, generally about 5 feet 6 inches thick at the bottom, and 2 feet 6 inches at the top, with a curved face. Wherever the wall had been removed, for the purpose of rebuilding it, the face of the clay behind appeared to stand quite straight, without any fissure. He was therefore induced to think, that water descended to various depths, according to the degree of permeability of the clay, and, as far as its action extended, expansion took place. If the whole mass had expanded from having been exposed to the action of air, before the face was covered with brickwork, the entire wall would have been moved forward, which was not the case.

General Pasley said, that from his observation of the usual character of slips, he was induced to think, that the slopes were generally too steep; 2 to 1 had been considered sufficient for almost all kinds of earth, although Sir Henry Parnell, in his Treatise on Roads, said, "When it is necessary to make a deep cutting through a hill, the slopes of the banks should never be less, except in passing through stone, than 2 feet horizontal to 1 foot perpendicular; for although several kinds of earth will stand at steeper inclinations, a slope of 2 to 1 is necessary, for admitting the sun and wind to reach the road." The same authority stated, "In the London and plastic clay formations, it will not be safe to make the slopes of embankments or cuttings, that exceed 4 feet in height, with a steeper slope than 3 feet horizontal to 1 foot perpendicular. In cuttings in chalk, and chalk marl, the slopes will stand at 1 to 1. In sand-stone, if it be solid, hard, and uniform, the slopes will stand at ¼ to 1, or nearly perpendicular." "There are many instances of slips in sand stone and marl strata alternating (when the line of road is parallel to the line of the bearing of the strata), where the slopes are as much as 4 to 1."

General Pasley had arrived at the conclusion, that 3 or 4 to 1 ought to be given, in order to insure good work; he had, therefore, authorized the railway companies to take possession of land, to increase the inclination of their slopes.

It was remarkable, that the slips rarely occurred during, or imdiately after, the formation of the cuttings; it would appear therefore probable, that the movement was caused by the combined action of the air upon the surface, and that of water, which had percolated through the upper strata, and acting behind it, forced the earth forwards in the line of least resistance.

He believed, that a series of gravel counterforts, with a revetment at the foot, was the most effectual method of preventing slips. On the South Western Railway hard chalk had been used with good effect, instead of gravel, for that purpose.

The perfect drainage both of the surface of the ground, on either side of the cuttings, and of the slopes themselves, was of the utmost importance. On the Eastern Counties Railway, shafts had been sunk at intervals in the slopes, and filled up with dry rubble; from their bottoms iron pipes proceeded to the face of the cutting; these had proved effective in draining away the water.

With regard to embankments, he was of opinion, that if more attention was paid to forming them only in propitious weather, placing the material in thinner layers, in a concave form, and draining them well as the work proceeded, the result would be more satisfactory, and less expensive, not only in the first cost, but in subsequently avoiding slips.

He thought, that in situations of difficulty, advantage would arise from the employment of wooden stages, like those which had been used by Mr. John Braithwaite at the Colchester embankment; the traffic of the railway was there carried on, over the wooden viaduct, until the subsidence of the earth had ceased, when the timber work was either cut off or drawn out, as the contractor found least expensive.

Mr. Bruff remarked, that the timber viaduct at the Colchester embankment was only adopted in consequence of the extreme subsidence of the material, which had assumed a slope of 6 to 1; he had seen the same material, which was plastic clay, stand well at a slope of 2 to 1. If an embankment was formed with that material in a wet state, it would inevitably spread at the foot.

The cuttings of the Eastern Counties Railway had remained open for 2½ years, but owing to the nature of the soil, the water would not drain from them.

Mr. Phipps corroborated the statement relative to the use of the timber viaduct on the Eastern Counties Railway; it was only an expedient to enable the railway to be opened at an earlier period than it could otherwise have been, in consequence of the subsidence of the embankment, which, however, now stood very well.

He approved of the formation of embankments, by depositing the material in thin layers, and by several lifts; the embankment was by that means rendered sounder, and less liable to slip.

Dry shafts and gravel counterforts had prevented many slips, but he thought that sufficient time had not elapsed since their adoption to enable an unqualified approval of them to be given. The pipes which had been inserted into the clay slopes did not appear at present to draw away much water.

Mr. Braithwaite said, it should be remembered that the soil at Brentwood Hill was very different from that on the Croydon Railway. The Brentwood sand was so full of water, that when it was opened it appeared semifluid, like a quicksand; the gravel counterforts, which had been effectual in stopping the movement of the London clay, would have but little effect in sand of such a quality as he had described.

He had seen much of the London clay in sinking wells, and it was notorious to well-sinkers, that even in the absence of moisture, if the London clay was left exposed to the air for a few hours, expansion took place, and the surface of the cutting began to fall away; by this expansion the walls of the wells were frequently fractured, unless allowance was made for it.

He could not agree with Mr. Cowper as to the cause he had assigned for the partial action upon the walls of the Euston

Square cutting. The London clay was impervious to water, therefore it could not arrive at the different parts of the wall, unless the line of junction between that clay and the pervious superstrata was very irregular in its course, as compared with the inclination of the railway.

General Pasley coincided in the opinion of the difficulty of working a material like the Brentwood sand, which was mixed with silt and quicksand, and demanded more than ordinary care: he thought that such ground should not be worked upon at all in wet seasons.

He believed, that in many cases slips had occurred, in consequence of the too great proximity of side cuttings, by which the ground between them and the foot of the embarkment, was too much weakened. He had in some cases recommended, that the side cuttings should be filled up, in order to consolidate the embankment.

Mr. Gregory believed, that the expansion of the clay was in some degree (but not entirely), the cause of slips. The blue clay was impervious to water; the yellow clay permitted the water to traverse it freely, by the natural joints and fissures in it, and also by those which were formed, by the drying action of the air upon its surface. When the face of the bed of the blue clay was softened by the action of water, and its surface became lubricated, there was not any longer sufficient friction between the strata, to retain the weight of the superposed yellow clay, the mass of which, on the slightest impetus being given by expansion, travelled forward down the inclined strata, which in the case of the New Cross cutting, was towards the railway.

He had tried the insertion of pipes into the sides of cuttings, and almost every other kind of drainage, without effect, and he was of opinion, that the general saturation of the mass was the cause of the slip in the New Cross cutting.

Mr. Hoof said, he had executed the greatest portion of the works on the Croydon Railway; his experience induced him to agree with Mr. Gregory in the statements contained in the paper, and in the reasons he had assigned for the causes of the New Cross slip.

Mr. Dockray doubted the advantages of the benches in the face of the slopes; he thought, that they not only caught and absorbed all the rain, but also a great portion of the water from the drains of the upper part of the cuttings; a well-drained slope, at a regular angle from the top to the bottom, would, in his opinion, act better.

He had observed, that the slips on the London and Birmingham Railway generally commenced, either in the line of the fence ditch, or in that of a catch-water drain, or at some natural or artificial obstruction, which prevented the free passage of the water, over the surface of the slope, into the ballast drains. He considered it of great importance, that the surface water should be carried off as rapidly as possible, and that it should not be permitted to lodge on the slopes, or in the drains; from whence it could only escape, either by evaporation, or by absorption into the ground: it was to the gradual operation of this latter cause, that he attributed most of the slips in clay cuttings.

In repairing such slips Mr. Robert Stephenson had used a plan, which had hitherto proved very successful. He regarded the slip, simply as a mass, moving down an inclined plane, by its gravity, and he proposed to counteract that tendency by friction. This was effected, by dividing the slipping mass into vertical sections, by excavating perpendicular chases, 5 feet wide, and passing completely through the slip, down into the solid clay below; these chases were 15 feet apart, and were filled up with masonry, or with chalk or gravel, well rammed down, so as to form a solid immoveable mass. Thus the slip was divided into a number of isolated portions, of comparatively small dimensions, each side of which came in contact with the side of a counterfort, and the friction between the masses had, in every case, proved sufficient to retain the slip from further movement.

This mode of repair was first adopted about 5 years ago, and had since been extensively used, in repairing the numerous slips in the slopes of the cuttings of the London and Birmingham Railway.

Mr. Gregory stated, that similar counterforts, with a revetment of gravel along the foot, had been tried, with good effect, on the Croydon Railway. He had understood, from military engineers, that thin revetments with long deep counterforts, bore a heavy fire better than thick revetments without them. He was well aware, that slips were frequently occasioned by catch-water drains on the face, or at the top of slopes; on that account, his attention was constantly directed to uninterruptedly keeping up the surface drainage of the earth-works under his charge.

Mr. Taylor believed, that the mechanical action of water produced many of the effects which had been mentioned, but the chemcal action upon clays, and even upon solid rocks, must not be overlooked. He would instance, particularly, the well-known action of the air upon shale, which, although so tough and hard under ground, as to require the agency of gunpowder for its excavation, became, after a few weeks' exposure to the air, thoroughly decomposed.

Decomposed granite, called by miners 'pot grawen,' was extremely troublesome in mines; it consisted principally of felspar and potash, and was the China clay (Kaolin) so much used in potteries. This substance would appear to have been formed by the decomposing action of the air, or of chemically-formed oxygen.

Pyrites, which appeared to have abounded in the strata of the New Cross cutting, not only had a natural tendency to decomposition, when exposed to the action of the air, but also affected every thing with which it was in contact.

It had become fashionable to account for all changes, by attributing them to the agency of electricity, and since the interesting researches of Mr. Fox, of Falmouth, there was much reason for believing, that electricity was capable of producing these wonderful changes. It was easy to understand, that as soon as chemical action began, electricity might be generated; its flow would be conducted through the fissures and veins of mineral substances; decomposition of the existing material proceeded, and other forms were assumed; this action could not be continued, without a corresponding alteration of the bulk of the mass, and when it reposed on an inclined bed, of which the surface was covered with a semifluid film, such as the London clay was described to be reduced to, by the solvent effects of water, the slightest expansion or contraction would suffice to set the whole superstratum in motion, and to produce the slips.

Primary rocks were subject to the same effects, and in sinking through porphyritic rocks, fissures were frequently found, filled with foreign matter, which swelled and forced in the sides of the shafts, when such an event was least expected; such occurrences could not be guarded against, as the direction of these fissures was usually parallel with that of the shaft.

Mr. Taylor agreed in the necessity for the precautions which had been mentioned, in cuttings and other railway works, and that it was generally only in such strata as clay-slate, granite, or other primary rocks, that works could be left without artificial protection. He had driven, on the line of the Tavistock canal, a tunnel of 1¾ mile long, through clay-slate and granite, which stood perfectly without any internal arching.

Mr. Smith said, that although he had but little experience in the formation of cuttings or embankments, he had devoted much attention to surface drainage. He had been surprised at the visible want of the precautions, which he conceived necessary, to prevent the saturation of the slopes, and their constant degradation. The back drains, which were frequently carried along the top of cuttings, were objectionable, and were likely to cause slips.

Slips were also, probably, caused by the alternate contraction and expansion of the clay, under exposure to changes of weather. From experiment it was ascertained, that clay occupied 1-7th or 1-8th less space when dried, than when in situ. It could be imagined, that during the summer, the combined effect of the sun and the wind formed cracks on the surface; the crumbling of the edges of these fissures partially filled them; the rain which fell in the winter, or was brought by the catch-drains from the neighbouring land, tended to restore the clay to its original bulk, but the fissures being prevented from closing, by the crumbled clay within them, which also swelled from the wet, the whole mass expanded in the line of least resistance, which was towards the cutting. This process being repeated, during several succeeding winters, would at length cause a slip.

The best method of prevention would, he thought, be a greater attention to surface drainage in the line of the slope, so as to carry off the water very rapidly. This had been attempted, by working the surface into parallel furrows and ridges, from the top to the bottom of the slopes; but neither those, nor the covered drains, were alone effectual. The latter were not deep enough; they should be 5 feet or 6 feet beneath the surface at the bottom, and 3 feet at the top of the slope, and not more than 16 feet apart, so as to be sufficiently close together, to collect and to carry off all the water that was not conducted down the slopes, by the furrows on the surface.

The gravel counterforts formed drains, and thus, he conceived, were more beneficial, than by increasing the friction between the masses, which could have but little effect, when once the mass of material was thoroughly saturated.

If embankments could be formed in very thin concave layers, equally spread and beaten down, in dry weather, while the clay was in hard lumps, leaving interstices, which, for a long time, would permit any water falling upon it to traverse freely, until the whole mass was consolidated, there would be but little subsidence. He was aware that this plan was too expensive, but the nearer it could be approached, with due regard to economy, the better would be the effect; whereas, by the present system of making embankments in all weathers, when frequently the whole mass was so thoroughly saturated, that it could never dry, nothing but failures could be expected.

General Pasley said, that he always supposed gravel counterforts were intended to act as drains, at the same time that they gave increased friction, and broke the continuity of the mass of earth, limiting any slip that might occur, to the extent of space between two counterforts.

Mr. Hawkshaw thought, that arbitrary limits could not be assigned for slopes in given strata; the different conditions under which the same strata appeared, in different localities, precluded any general law. Clay, which in a wet situation required a slope of 3 to 1, would, in another position, stand well at 2 to 1. In the Andes (South America), he had seen granite in such a decomposed state, that it would have been very unsafe to have left perpendicular sides in a cutting through it. The drift formation of Lancashire might also be instanced. Sand was found, on the line of the Manchester and Bolton Railway, which stood well in slopes of 30 feet high, at an inclination of 2 to 1. These slopes were kept perfectly dry by drains, running at intervals from the top, down to the bottom of their faces.

In mining operations, the expansion of clay was well understood. The floors of old mines were always expected to swell up. In the tunnel on the Manchester and Bolton Railway, the timbers were frequently broken by the expansion of the clay, although it appeared quite dry.

Mr. Sopwith instanced the 'creep' in collieries, which had been attributed to this expansive action, but rather thought, that the complete closing of old mines, was owing to the weight of the superincumbent rocks, which acting upon the pillars and walls, forced up the floor. The subsiding of the surface, which was so frequent in mining districts, corroborated this view.

Beneath the village of Wallsend there was a tract of coal, which the late Mr. Buddle hesitated to get, but at last he decided upon continuing the working in that direction, and the whole village had subsided nearly 2 feet vertically; but, by care in the workings, it had occurred without materially damaging any of the buildings.

Mr. Forster said, although it was well known, that in mines which were carried to a considerable depth, the 'creep' would occur, and the floor of undisturbed clay appeared to rise, he believed it to be an erroneous idea, and that in consequence of the partially supported weight of the strata above, the roof sunk down, causing the centre of the floor to form a 'horse-back,' as it was termed by the miners. When some old mines, in which this had occurred, were entered and worked after a lapse of years, the indurated clay of the floor had supported the roof, while the coal, which had been formerly left as pillars, was subsequently cut away.

It was true, that when the floor was soft, it would swell. In the Primrose Hill and the Kilsby tunnels, if the cutting was left for a few days, without completing the brick arching, the timbers were broken. The expansion appeared to be nearly the same, whether it was caused by the air, as in the former case, or by the water, as in the latter instance.

Mr. Thomson remarked, that in the Box Tunnel it was usual to allow 6 inches for expansion, between the face of the work and the timbers, and that space was scarcely sufficient.

Mr. Buck said, that in the Heaton Norris cutting, which was chiefly through sand, containing much water, he had completely drained the slopes, and had stopped the running of the sand, by building, at the foot, a retaining wall about 4 feet in height and from 2 feet to 3 feet thick, with a backing of 2 feet in thickness of cinders. He was induced to do this by observing, that cinders were constantly used in the neighbourhood, for forming drains, and he had generally found, that from careful observation of local habits, valuable hints might be gained.

Mr. Simpson had devoted much attention to embankments and cuttings in London clay, and had found it very treacherous and difficult to manage; he believed that an inclination of 4 to 1 was not too much for a slope of any considerable height.

He remembered the embankments of a reservoir near London, which had been originally constructed with insufficient slopes; within a few months after they were finished large masses slipped down, and it was feared, that the whole must have been destroyed. At first, attempts were made to repair the slips with mingled gravel and sand, but although the slopes were then formed at an inclination of about 3 to 1, they did not stand; after 3 years, they were made up with gravel and clay, mixed with materials from the dust-yards of the metropolis, containing a mixture of all kinds of substances; this was of a dry, porous nature, and the slopes had stood well since, although they were subjected to very variable pressure, sometimes having a head of water of 20 feet upon them, and the next day much less.

In constructing embankments, it was his custom to have a footing of brickwork, resting against a toe of concrete, and with careful attention to the drainage, he found this plan always successful.

He attributed the first motion of slips in railway cuttings, to the action of water, and unless the water was diverted by complete back drainage, and that on the surface and within the slopes was carried rapidly away, the slopes would never stand, even at the inclinations which had been mentioned.

The expansion of the London clay was certainly very remarkable; he had seen, at Richmond, a well of 4 feet diameter completely closed in one night by the swelling up of the bottom, although there was not any water in it.

Mr. Clutterbuck observed, that slips in railway cuttings appeared to be caused, sometimes by the geological condition of the soil, when acted upon by water, and sometimes by what might be termed its chemical condition; the latter was produced by the air causing such a disintegration, as rendered it more pervious to water, and consequently more liable to be acted upon by its mechanical force.

All railways passing from London must, more or less, intersect the London and plastic clays; the sand beds of the latter formation rested upon the chalk, and if those sands were washed away or shaken, a slip of the superstratum would necessarily follow. The plastic clay above the sand beds, was deposited in layers, in which a certain order of superposition might be traced; he had recognized a striking similarity between those beds under London, and at the outcrop near Watford: the distinct layers were known, and names were given to them, by those persons who sunk shafts for getting the sand; it was understood, that their security in working the sand, depended on the thickness and strength of some of the beds; to their inequality of strength, might probably be attributed some of the slips that occurred in that formation.

The plastic clays were usually covered by a stratum or bed of silt, containing shells, sharks' teeth, &c., and upon the silt rested the strong blue London clay; the most inveterate slips that he had observed on the London and Birmingham Railway, occurred in those localities, where the silt was covered by a thin outcropping bed of the London clay, not sufficiently thick to resist the infiltration of water; the silt thus became saturated with water, and slid from the surface of the tenacious plastic clay lying beneath it.

The cutting at Brentwood passed through strata, which he believed to be silt, covered by beds or layers of loam, sand, and gravel, all more or less pervious to water; thus causing slips, which were attributable to the geological condition of the soil.

In the London clay, where there was no superficial deposit of gravel, the slips, he thought, might be traced to its chemical condition. A distinction was often made, between the yellow clay on the surface, and the blue clay beneath; this difference of colour was caused by the state in which the iron existed in the soil; when excluded from the action of the air, it was found as a protoxide; and in the upper beds, when subject to that action, it became a peroxide; hence the difference of the colour, and, as he conceived, the cause of a certain amount of disintegration. The air was admitted by the cracks formed in the clay in drying, or by the roots of trees and plants (whose course might be traced by the difference of colour in the clay); by the working of the earthworm, and by other causes. The water which fell on the surface, carried particles of sand and other substances into the fissures, rendering the clay, in some measure, permanently pervious to water: it was to this percolation of water through the upper or yellow beds of the London clay, that slips, such as that at New Cross, might, he conceived, he attributed.

It was the practice, on many railways, to cut a back ditch between the boundary railing and the quickset fence; this appeared to have caused many slips. The bottom of the ditches being exposed to the action of the air would, when they received a flush of water, permit its infiltration below the top of the slope; he had remarked, that many slips occurred, about 1 foot or 2 feet below the bottom of these ditches, which was about the angle at which the water would drain towards the face of the cuttings.

In some cuttings, apparently with the object of economizing space, the slope was carried to the edge of the quickset fence; where that was done, the slips seemed more frequent, than where the ditch was further removed from the edge of the slope.

Sir Henry Delabèche said, that he viewed railway works with great interest, as opening a large field for the economic geologist. The causes of the slips, which had so frequently occurred in cuttings, deserved careful investigation, and great benefit would result, not only to the scientific world, but in the practice of engineering, if those who had charge of such works, carefully watched and recorded every event connected with their progress;

such as the nature and position of the strata, their amount of natural drainage, the effect of weather, and all other points calculated to produce any changes.

With respect to the origin of slips in general, but more particularly of those in the London clay, Mr. Clutterbuck had treated the subject so well, and his remarks contained so much truth, that there remained but little to be said.

Whether the attention was turned to cliffs on the sea coast, to mountain cuttings, or to artificial embankments, it would be seen, that, in the majority of cases, the slips were caused by the action of water. Wherever there existed a soft vein, beneath strata with fissures which enabled the water to percolate, the substratum became mud, and being squeezed out by the superposed weight, caused the whole mass to slip.

There were many instances of this kind in the oolitic escarpments near Bath. They were extremely interesting, from being the scene of the labours of Mr. Smith, who had justly been styled the father of geology in England. In that district, Mr. Smith had cured and also prevented many threatening slips, by introducing a system of surface drainage, at the same time tunnelling into the face of the escarpment, to drain the beds, and to prevent the water from reaching the softer strata beneath.

At Lyme Regis, the strata, having a certain degree of inclination, became saturated with water, the softened mass was forced out from the lower parts, and caused the slips which so frequently occurred on that coast.

It was evident, that the various angles at which different earths would stand, depended, in a great measure, upon the relative tendency of the materials to form mud.

The Directors of the Eastern Counties Railway had requested him to visit the Brentwood cutting with Mr. John Braithwaite, their engineer. The strata in that locality were nearly horizontal, and although the material cut through would have been easily set in motion on an inclination, he was of opinion, that the banks would stand well, if they were perfectly drained. The ground was, however, very full of water; it was also of a very tenacious nature; but he had observed much water running out from beneath the upper and dryer beds. A good system of drainage was the only preventive or cure; Mr. Braithwaite was so well convinced of that fact, that he planned and executed the dry shafts which had been mentioned: the credit of all the good they had produced must be given to Mr. Braithwaite.

Sir Henry Delabèche did not attribute much advantage to the friction of the gravel buttresses; their weight, force, and friction, might retard a slip for a time, but unless the buttresses entered the water-bearing strata, and served as perpetual drains, they would not be efficacious.

The London clay was not homogeneous in its nature; it was more or less pervious, and abounded with fissures in all directions; many of these were filled with a slimy substance, which was easily converted into mud by the percolation of water, and hence slips so frequently occurred, where cuttings were made through the dip of the London clay, as at New Cross. Surface-drainage was not sufficient for such strata; the main springs must be tapped, and regular drainage be established, otherwise slips would be of constant occurrence.

The rocks of Rossberg (Switzerland) and the Undercliff at the back of the Isle of Wight, might also be quoted, as instances of the same action of water, in converting the lower beds into mud, upon which the superstratum slipped, in spite of all attempts to restrain it.

Captain Moorsom had seen several instances where, in forming embankments of gravel upon a clay bottom, the wet substratum had been squeezed out, and had caused the foot to spread, until it was stopping by weighting it, and thus re-establishing the equilibrium.

He thought, that back-drainage was essential, and he had rarely found it unsuccessful, if it was commenced far enough from the edge of the cutting. It should be so contrived, as to allow the surface-water to flow rapidly and freely away. He had repeatedly found tapping and under-draining ineffectual, unless the surface-drainage was thoroughly completed.

He had used benching with good effect, where an overlay of wet gravel rested on clay; the method he adopted was to remove the gravel in the upper part of the slope, sufficiently to enable a good catch-water drain to be formed, along the bench in the clay.

This plan he considered very effectual in certain positions, as a means of preventing slips. Slopes of 1½ to 1 for a maximum height of 40 feet, which had been so constructed, had stood well for upwards of 5 years.

In other situations, after slips had occurred, he had used back-draining with good effect, where tapping and leading-drains had failed. The method pursued, was to cut a drain at the back of the slip, so as to intercept the water which flowed thither, either from springs or by infiltration.

At the bottom of the drain was placed a round pot drain, covered with a thickness of brushwood, and the remaining depth was filled with gravel or rubble. For positions where it was practicable to cut the back-drain, he recommended this system.

With reference to the depth of cuttings and the angle of slopes, in various materials and under different conditions, he thought, that each case must be regulated by the particular nature of the soil, the facilities for drainage, and the means adopted, besides many other local considerations, so that it was nearly impossible to lay down any arbitrary rules on the subject.

In one situation, he had seen a cutting through gravel and sand stand excellently at an inclination of 1½ to 1, although the cutting was 86 feet deep, and on one side was placed a spoil-bank of 24 feet in height, making 110 feet in all, forming a regular slope. In another position, he made a cutting of 57 feet in depth, through gravel, which stood well at a slope of 1 to 1.

Mr. Bruff stated, that the timber staging, erected on some of the Eastern Counties Railway embankments, had not been resorted to for obviating the formation of the clay banks in wet weather, but was merely contrived for expediting the work, so as to admit of the railway being opened to the public, at an earlier period than would have been possible, had solid embankments been first formed. The timber staging was erected on three embankments, which could not be completed in time, and on another where the nature of the material, in its then wet state, would not admit of its being formed to more than half its height; all these embankments had, however, since been filled up to the regular level.

The cutting through Brentwood Hill, presented some features in the execution, different from those on the Croydon Railway; he presented to the Institution a copy of the contract plan (No. 3615), of the Eastern Counties Railway, with such amendments and additions as were considered desirable, during the progress of the works, and since their completion.

The drawing gave a ground plan, exhibiting the position of the cutting, spoil-banks, &c., with longitudinal and transverse sections of the cutting, showing the extent of the excavation and the slopes, the benchings, culverts, wells, drain-pipes, and gravel counterforts.

The nature of the material of the cutting was sand, sand with loam, gravel, and silt.

The great difficulty experienced in draining the slopes, had arisen from the slimy nature of the silt, from which the water could not be separated. Its power of holding water might be imagined, from the fact of the face of nearly 50 feet of slope, being exposed nearly 2 years, without producing any sensible effect in the drainage of the material.

The silt had a constant tendency to flow away with water, and great attention was directed to that point, in order to prevent the slopes from being injured.

The provision for upholding and draining the slopes comprised in the contract, consisted of a fence ditch at the top of the cutting, a benching 10 feet wide, half way down, and the ordinary side drains at the foot, with drain pipes, running in various directions, along the face of the slopes. To this was subsequently added a culvert, on the benching on each side, with proper outfalls; then the wells were adopted, and lastly, gravel counterforts. The wells were not placed with any regularity, but were sunk at the wettest parts of the slopes; they were steined as in ordinary well work, until within about three feet from the bottom, where an inner ring of brickwork, 4½ inches thick, was built in cement. The bottoms of the wells were not bricked, but each had an outlet pipe of about 2 inches diameter, into the open drain below it. There were twenty of these wells, in the upper part of the north slope, ranging in depth from 15 feet to 20 feet, and 3½ feet in diameter. In the lower part of the same slope, there were twenty-five wells of the same diameter, but only 10 feet deep. In the same slope, seven gravel counterforts of a prismoidal shape were afterwards added; they were formed by cutting out the requisite cavity, and barrowing in dry gravel from above, without pounding.

Neither wells nor counterforts had been adopted on the south slope, which was on the lower side; the cutting being through ground slightly inclined to the south.

These plans for draining the cutting were, Mr. Bruff believed, all designed by Mr. John Braithwaite; Mr. Phipps had tried a somewhat different plan.

A narrow trench was cut along the wettest part of the slope, as deep as it could be excavated, without much shoring of the sides; a small culvert was laid in the bottom, having an outfall into the open drain at each end. On the lower side a puddle wall was raised, and at its back, a dry rubble wall with straw above it, to prevent the sand and loam from washing into and choking the interstices. This plan was simple and inexpensive, and was stated to have answered its intended purpose.

With respect to the general question of slips in cuttings, Mr. Bruff was convinced, that want of thorough drainage was the proximate cause. In the Brentwood cutting there had been two slips, both of which, in his opinion, arose from the surface water being checked by the spoil-banks, and being allowed to soak through the surface down to the slopes.

In most cases where slips occurred in side-lying ground, it would be observed, that the upper slope almost invariably gave way first. In embankments on side-lying ground, slips generally occurred first on the lower side, which might be attributed to want of friction, as well as to the agency of water.

The effect of a drain above and near to a slope, in an excavation, had not hitherto been sufficiently attended to; in inclined ground, a rubble catch-water drain should, in his opinion, be formed parallel to the whole length of the cutting, at a distance from the upper edge of the slopes, varying with the depth and nature of their material. In a depth of 20 feet, he thought that it should be set back at least the length of a chain.

Spoil-banks placed near to the slopes of cuttings, also appeared to him to be injudicious; in the cases of the Croydon and the Blisworth slips, which had been mentioned, he had no doubt, that the spoil-banks contributed as much to produce slips by checking the drainage, and by the increased quantity of surface-water they threw into the slopes, as they did by their great superposed weight on the edge of the banks.

It was a curious fact, which he deemed worthy of notice, that serious slips seldom occurred, until 2 or 3 years after the completion of the earthwork; the large sums usually left by contractors, to cover one year's risk of maintenance, might therefore, he conceived, be dispensed with.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1845.

Jan. 31. *Schoolings & Everet*, of Great Garden-street, Whitechapel, London, for a gas stove.

31. *William Glegg Gover*, of 8, Chester-square, Middlesex, for a window-sash.

Feb. 3. *Edward Brainerd Webb*, of Barnstaple, Devon, for an improved instrument for drawing and cutting out circles and ovals.

4. *John James Ridge*, of 196, Parrock-street, Gravesend, for a tooth-powder holder.

6. *William Joseph Joyner*, of Aveley Hall, near Romford, for an improved chaff-cutting machine.

6. *John & Robert Mallet*, of the Victoria Foundery, Dublin, for a railway screw-bolt and nut.

8. *Joseph Skertchly & Thomas Norman Gilbert*, of Leicester, for a portable cabinet mangle.

11. *G. Eckstein*, of High Holborn, for an improved cutting edge for spades and hoes.

11. *David & James Macdonald*, of Glasgow, for a self-acting lithographic press.

12. *John Workman*, of Stamford Hill, Middlesex, for a pneumatic conductor.

14. *Jeremiah Smith*, of 42, Rathbone-place, for a letter envelope.

15. *Thomas Horne*, of Birmingham, for a cornice-pole, baluster-rail, &c.

17. *John Blakeney*, master of the "Isle of Arran" steamer, plying on the Firth of Clyde, and *Paul Cameron*, of 38, John-street, Bridgeton, Glasgow, for a compound logarithmic rule.

Feb. 18. *Henry Madden*, of 14, George-street, Adelphi, for a coffee percolator.

21. *Hall & Wilson*, of King-street, Manchester, for a flue-valve.

21. *Charles Wheeler*, of Speenhamland, Berks, for an expanding spring piston.

21. *Charles White*, of Danes Cottage, Lincoln, for an improved razor heater.

22. *John Barnett*, of George-street, St. Paul's, Birmingham, for a machine for bending or curving metallic tubes.

24. *James Aldous*, of 3, Mount Pleasant, East-road, City-road, for an atmospheric register for regulating the temperature of rooms.

25. *George Elliott*, of Hasland-bridge, near Chesterfield, Derbyshire, for a two-wheeled vehicle.

List of Patents

That have passed the Great Seal of IRELAND, to the 17th of February, 1845, inclusive.

To Henry Adolphe Dubern, of Paris, in the kingdom of France, merchant, for improvements in atmospheric railways.—Sealed 25th January.

William Thomas, of Cheapside, in the city of London, merchant, for improvements in manufacturing stays, bandages, and other similar articles.—Sealed 21st January.

Pryce Buckley Williames, of Llegodig, in the county of Montgomery, in North Wales, Gent., for certain improvements in the manufacture of artificial stone.—Sealed 21st January.

John Dearman Dunnicliffe, of the town and county of the town of Nottingham, lace manufacturer, for certain improvements in the manufacture of lace and other weavings.—Sealed 1st February.

Thomas Brown Jordan, of Cottage-road, Pimlico, in the county of Middlesex, mathematical divider, for improvements in the manufacture of blocks or surfaces for surface-printing, stamping, embossing, and moulding.—Sealed 1st February.

John Henry Rehé, of Moscow-road, in the county of Middlesex, surgeon, for improvements in the manufacture of starch and farinaceous food.—Sealed 1st February.

Frederick Steiner, of Hyndburn Cottage, near Accrington, in the county of Lancaster, Turkey-red dyer, for his invention of certain colors in cotton, woollen, silk, and linen fabrics.—Sealed 1st February.

Joseph D'Aguilar Samuda, of the Southwark Iron Works, engineer, and Samuel Clegg, of the same place, engineer, for certain improvements in the manufacture and arrangement of parts and apparatus for the construction and working of atmospheric railways.—Sealed 5th February.

Felix Moreau, of Ghent, in the kingdom of Belgium, engineer, for improvements in the manufacture of corks and other similar articles, made of cork, wood, or other materials, and the application of certain of the refuse matters to various useful purposes, for which they have never heretofore been employed.—Sealed 18th February.

List of Patents

Granted for SCOTLAND, subsequent to January 22nd, 1845.

To Pierre Armand Le Comte de Fontainemoreau, of Skinner's-place, Size-lane, London, for certain improvements in covering or coating metals and alloys of metals,—being a foreign communication.—Sealed 24th January.

Alexander Bain, of Charlotte-street West, London, engineer, for improvements in apparatus for ascertaining and registering the progress and direction of ships and other vessels through water; and for ascertaining the temperature in the holds of ships and other vessels; for taking soundings at sea; and in apparatus used in lighthouses.—Sealed 27th January.

George Brown, of Glasgow, merchant, for certain improvements in the manufacture of soda,—being a foreign communication.—Sealed 27th January.

John Reed Hill, of Chancery-lane, civil engineer, for improvements in a press or presses, machine or machines, for letter-press printing.—Sealed 28th January.

John George Bodmer, of Manchester, engineer, for certain improvements in locomotive steam-engines and carriages to be used upon railways; in marine engines and vessels; and in apparatus for propelling the same; and also in stationary engines, and in apparatus to be connected therewith.—Sealed 29th January.

John James Russell, and Thomas Henry Russell, both of Wednesbury, Staffordshire, tube manufacturers, for improvements in the manufacture of welded iron tubes.—Sealed 30th January.

John Rand, of Howland-street, Fitzroy-square, London, artist, for improvements in piano-fortes,—being a foreign communication.—Sealed 30th January.

Christopher Dunkin Hays, of Bermondsey, Surrey, master mariner, for certain improvements in machinery or apparatus for propelling vessels.—Sealed 31st January.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for certain improvements in apparatus for propelling vessels,—being a foreign communication.—Sealed 4th February.

Robert Gordon, of Heaton Foundery, Stockport, millwright and engineer, for certain improvements in grinding wheat and other grain, and in dressing flour and meal, which improvements are also applicable to grinding cement and other substances.—Sealed 5th February.

George Bell, of Pembroke-road, Dublin, for improvements in drying malt, grain, and seeds.—Sealed 5th February.

Peter Borrie, of Princes-square, St. George's, London, engineer, for certain improvements in steam-engines, boilers, and propelling machinery.—Sealed 13th February.

Arthur Varnham, of the Strand, stationer, for improvements in the manufacture of paper, in order to prevent fraud, which he intends to call "safety and protective paper."– Sealed 13th February.

Francis Stanislas de Sussex, of Bethnal-green, London, chemist, and Alexander Arnott, of Gloucester-crescent, Regent's-park, chemist, for improvements in the manufacture of oxides of manganese.—Sealed 13th February.

Frank Hills, (not designed,) for certain improved means for producing or manufacturing artificial coal or fuel, and other useful products connected therewith.—Sealed 17th February.

Joseph Thomas, of Finch-lane, Cornhill, London, publisher, for a new and improved tube,—being a foreign communication.—Sealed 17th February.

William Edward Staite, of High-street, Marylebone, London, for certain improvements in the processes and apparatus for preparing extracts and essences of vegetable and animal substances.—Sealed 19th February.

New Patents

SEALED IN ENGLAND.

1845.

To Johann Gottlob Seyrig, of Lenton, Nottingham, mechanician, for improvements in scouring, bleaching, and dyeing machines, also in machines used in filtering, and in drying or extracting liquid or moisture from different substances. Sealed 25th January—6 months for inrolment.

George Henry Taunton, of Liverpool, civil engineer, for improvements in machinery for revolving windlasses, barrels, spindles, shafts, and for pumping. Sealed 25th January—6 months for inrolment.

William Trueman Yule, of Wilson-street, Finsbury-square, preserved provision manufacturer, for improvements in preserving animal and vegetable matters. Sealed 28th January—6 months for inrolment.

Thomas Earl of Dundonald, for an improved rotary engine to be impelled by steam, and which may be also rendered applicable to other purposes,—being an extension, for the term of 14 years, of letters patent granted to him by His late Majesty King William the Fourth. Sealed 28th January.

Martyn John Roberts, of Bryn-y-cæran, Carmarthenshire, Gent., for improvements in machinery for preparing and winding, and spinning and winding wool, flax, and other fibrous bodies. Sealed 28th January—6 months for inrolment.

George James Norton, of Weymouth, Dorsetshire, cook and confectioner, for an improved cooking apparatus; parts of which are also applicable to the purposes of lighting and heating. Sealed 28th January—6 months for inrolment.

Nathan Whiteley, jun., of Stoney Bank, Huddersfield, manufacturer, and Joseph Hopkinson, jun., of Huddersfield, engineer, for certain improvements in machinery or apparatus for raising the nap or pile on woollen, cotton, or other cloths, also for brushing and cleaning the same. Sealed 28th January—6 months for inrolment.

Edwin Rose, of Ogley, Staffordshire, engineer, for certain improvements in the manufacture of grain into flour or meal. Sealed 28th January—6 months for inrolment.

John Leslie, of Conduit-street, Hanover-square, tailor, for improvements in stoves and apparatus used in consuming fuel, and in ventilating. Sealed 28th January—6 months for inrolment.

Mathew Allen, of Worship-street, Shoreditch, builder, for certain improvements in stoves and apparatus for heating. Sealed 30th January—6 months for inrolment.

Henry Page, of Cambridge, painter, for certain improvements in the mode of painting or decorating with oil and other colors. Sealed 30th January—6 months for inrolment.

James Johnston, of Willow Park, Greenock, Esq., for new and improved processes and machinery for making and refining sugar. Sealed 31st January—6 months for inrolment.

Thomas Middleton, of Loman-street, Southwark, engineer, for improvements in machinery for the manufacture of artificial fuel, bricks, tiles, and other similar articles. Sealed 31st January—6 months for inrolment.

Arthur Varnham, of the Strand, stationer, for improvements in the manufacture of paper, in order to prevent fraud, which he intends to call "safety and protective paper." Sealed 4th February—6 months for inrolment.

William Snoxell, of the Quadrant, blind manufacturer, for improvements in roller blinds and shutters. Sealed 4th February —6 months for inrolment.

William Henry Smith, of Wellingborough, Northamptonshire, boot manufacturer, for certain improvements in the construction of boots, shoes, and other coverings for the legs and feet, and also in the means of, or apparatus for, fastening the same upon the leg or foot. Sealed 4th February—6 months for inrolment.

Henry Nibbs Browne, of Shadwell, sugar refiner, for improvements in the manufacture of sugar. Sealed 4th February—6 months for inrolment.

John Seaward, of the Canal Works, Poplar, engineer, for certain improvements in steam-propelling machinery. Sealed 5th February—6 months for inrolment.

Darius Isaac Green, of Villiers-street, Strand, Gent., for improvements in the means of raising and moving heavy bodies; parts of which are applicable, amongst other uses, to mines, vessels, and public works,—being a communication. Sealed 8th February—6 months for inrolment.

Robert Bewick Longridge, of the Bedlington Iron Works, Northumberland, for an improved locomotive engine. Sealed 10th February—6 months for inrolment.

Frederick Herbert Maberly, of Stowmarket, Suffolk, clerk, Master of Arts, for certain improvements in machinery, or the apparatus for stopping or retarding railway or other carriages; applicable also for these purposes in regard to other engines or wheels. Sealed 10th February—6 months for inrolment.

Thomas Trueman, of Cromwell Lodge, Brompton, Gent., for an apparatus, being an improvement, for filtering and purifying water. Sealed 10th February—6 months for inrolment.

Richard Haworth, of Bury, in the county of Lancaster, engineer, for certain improvements in steam-engines. Sealed 10th February—6 months for inrolment.

William Irving, of Regent-street, Lambeth, engineer, for improvements in the construction of apparatus for cutting ornamental forms, beads, recesses, and mouldings in wood, stone, and other materials. Sealed 10th February—6 months for inrolment.

Peter Fairbairn, of Leeds, engineer, for certain improvements in machinery for drawing, roving, and spinning hemp, flax, tow, silk, wool, and other fibrous substances. Sealed 10th February—6 months for inrolment.

Oglethorpe Wakelin Barratt, of Birmingham, experimental chemist, for certain improvements in the manufacture of acids; and in treating the noxious vapours or gases given off from chimneys, and from chemical and other works. Sealed 10th February—6 months for inrolment.

John Brumwell Gregson, of Dunston, Durham, manufacturing chemist, for improvements in the manufacture of Epsom salts, and carbonate of lime, commonly called precipitated chalk; parts of which improvements are applicable to other purposes. Sealed 10th February—6 months for inrolment.

Joseph Quick, of Samner-street, Southwark, Surrey, engineer, for an improvement in steam-engines. Sealed 10th February—6 months for inrolment.

James Clark, of the city of Glasgow, power-loom manufacturer, for certain improvements in weaving. Sealed 14th February—6 months for inrolment.

Thomas Brown Jordan, of Cottage-road, Pimlico, mathematical divider, for improvements in machinery and apparatus for cutting, carving, and engraving. Sealed 17th February—6 months for inrolment.

James Graham, of Calvert-street, metal refiner, for improvements in the manufacture of zinc, antimony, and brass, in casting brass, and in apparatus for making pots used in such processes. Sealed 17th February—6 months for inrolment.

John Weatherstone, of Cassington, Oxford, yeoman, for an improved dibbling machine for planting seed or grain. Sealed 20th February—6 months for inrolment.

John Bottom, of St. Philip's-road, Sheffield, machinist, for certain improvements in carpenter's stocks and braces. Sealed 20th February—6 months for inrolment.

John Place, of Hoddlesden, Lancashire, manufacturer, for certain improvements in looms for weaving. Sealed 20th February—6 months for inrolment.

Robert Oxland, of Plymouth, chemist, for improvements in the manufacture of chlorine. Sealed 20th February—6 months for inrolment.

William Stevens Villiers Sankey, of Hampstead, Master of Arts, for certain improvements in fastening and securing letters, packets, and dispatches. Sealed 20th February—6 months for inrolment.

George Brown, of Glasgow, in Scotland, merchant, for certain improvements in the manufacture of soda,—being a communication. Sealed 20th February—6 months for inrolment.

Samuel Hall, of King's Arms Yard, Coleman-street, civil engineer, for improvements in steam-engines, boilers, furnaces, and flues, in consuming fuel, preventing smoke, and in propelling vessels. Sealed 20th February—6 months for inrolment.

James Murdoch, of Staple Inn, Middlesex, mechanical draughtsman, for certain improvements in the manufacture of gas, and in the apparatus employed therein,—being a communication. Sealed 20th February—6 months for inrolment.

John Baptiste Vallaure, of Oxendon-street, civil engineer, for improvements in lamps and wicks. Sealed 24th February—6 months for inrolment.

Joseph Howard, of Blackfriars-street, in Manchester, Lancashire, hatter, for certain improvements in the manufacture of silk plushes, silk velvets, worsted and other plushes. Sealed 24th February—6 months for inrolment.

CELESTIAL PHENOMENA FOR MARCH, 1845.

D.	H.	M.	
1			Clock before the sun, 12m. 35s.
—			☽ rises 1h. 37m. M.
—			☽ passes mer. 5h. 51m. M.
—			☽ sets 10h. 2m. M.
			Occul. 2 Sagittarii, im. 18h. 56m.
	10	14	☽ in □ or last quarter
2	0	9	♂ in conj. with the ☽ diff. of dec. 2. 16. S.
3	4	56	♂ in the descending node.
	7		☽ in Perigee
5			Clock before the sun, 11m. 43s.
—			☽ rises 4h. 51m. M.
—			☽ passes mer. 9h. 42m. M.
—			☽ sets 2h. 41m. A.
	11	33	♄ in conj. with the ☽ diff. of dec. 5. 33. S.
6	13	22	♀ in conj. with the ☽ diff. of dec. 6. 53. S.
	23		☿ in conj. with the ☽ diff. of dec. 7. 42. S.
8	6	36	Ecliptic conj. or ● new moon
9	5	36	♅ in conj. with the ☽ diff. of dec. 5. 1. S.
	14	53	♃ in conj. with the ☽ diff. of dec. 5. 8. S.
10			Clock before the sun, 10m. 29s.
—			☽ rises 6h. 54m. M.
—			☽ passes mer. 1h. 50m. A.
—			☽ sets 9h. 1m. A.
	8	53	♀ in Aphelion
11	10	38	☿ greatest hel. lat. S.
12			Occul. 53 Arietis, im. 10h. 11m. em. 11h. 6m.
14	19	12	Vesta in conj. with ♅ diff. of dec. 4. 46. S.
15			Clock before the sun, 9m. 7s.
—			☽ rises 9h. 41m. M.
—			☽ passes mer. 5h. 50m. A.
—			☽ sets 1h. 11m. M.
	12		☽ in Apogee
16	1	53	☽ in □ or first quarter
18			Mercury R. A. 23h. 39m. dec. 4. 9. S.
—			Venus R. A. 22h. 57m. dec. 8. 6. S.
—			Mars R. A. 18h. 26m. dec. 23. 36. S.
—			Vesta R. A. 0h. 27m. dec. 2. 35. S.
—			Juno R. A. 9h. 10m. dec. 9. 34. N.
—			Pallas R. A. 20h. 2m. dec. 8. 7. N.
—			Ceres R. A. 21h. 8m. dec. 22. 10. S.
—			Jupiter R. A. 0h. 47m. dec. 3. 51. N.
—			Saturn R. A. 21h. 11m. dec. 17. 2. S.
—			Georg. R. A. 0h. 22m. dec. 1. 39. N.
—			Mercury passes mer. 23h. 58m.
—			Venus passes mer. 23h. 15m.
—			Mars passes mer. 18h. 41m.
—			Jupiter passes mer. 1h. 3m.
—			Saturn passes mer. 21h. 24m.
—			Her. passes mer. 0h. 38m.
19			Occul *a*1 Cancri, im. 7h. 36m. em. 8h. 51m.
			Occul. *k* Cancri, im. 15h. 2m. em. 15h. 30m.
20			Clock before the sun, 7m. 38s.
—			☽ rises 2h. 45m. A.
—			☽ passes mer. 9h. 46m. A.
—			☽ sets 4h. 11m. M.
	4	8	Ceres in conj. with ♄ diff. of dec. 5. 3. S.
	5	45	☉ enters Aries, spring com.
			Occul. *e* Leonis, im. 13h. 3m.
22	7	33	☿ in sup. conj. with the ☉
23	8	19	Ecliptic oppo. or ○ full moon
24	6	9	☿ in conj. with ♅ diff. of dec. 0. 22. S.
25			Occul. *A.S.C.* 1610, im. 12h. 1m. em. 13h. 5m.
25			Clock before the sun, 6m. 6s.
—			☽ rises 8h. 56m. A.
—			☽ passes mer. 0h. 58m. M.
—			☽ sets 6h. 7m. M.
26			Juno stationary
			Occul. *i* Libræ, im. 13h. 53m. em. 14h. 29m.
26	13	0	♅ in conj. with the ☉
	20	9	☿ in conj. with Vesta, diff. of dec. 4. 51. N.
27			Occul. *A.S.C.* 1854, im. 13h. 52m. em. 14h. 56m.
28	1		☽ in Perigee
	19	6	☿ in conj. with ♃ diff. of dec. 0. 52. N.
30	5		☽ in □ or last quarter
30	9	33	☿ in the ascending node
	12	20	♂ in conj. with ☽ diff. of dec. 4. 24. S.
			Occul. *d* Sagittarii, im. 15h. 8m.

The eclipses of the satellites of Jupiter are not visible from the 10th day of March, until the 4th day of May, Jupiter being too near the sun.

J. LEWTHWAITE, Rotherhithe.

THE
LONDON JOURNAL,
AND
REPERTORY
OF
Arts, Sciences, and Manufactures.

CONJOINED SERIES.

No. CLX.

RECENT PATENTS.

To **Jean Albert Palmaert,** *of Brussels, colonel of staff, for improvements in the means of economizing and applying heat obtained from known processes,—being partly a communication.*—[Sealed 29th August, 1844.]

This invention has for its object the economization and employment of the heat arising from coke ovens during the manufacture of coke. The beneficial application or employment of the waste heat arising from coke ovens, is a subject which has occupied the attention of manufacturers for some years past; but their attention has been principally directed to the economization of the heat which escapes by radiation during the carbonization of pit coal. As to the gaseous products arising from this operation, they have only been made use of for interrupted operations, and therefore they have not been completely burnt during all the time they are being disengaged; nor has a method of heating as yet been obtained, of such regularity as could be beneficially applied for generating steam for a steam-engine, so as to make it act in a uniform manner. The irregularity of the process of carbonization is sufficient to account for the difficulty which exists of causing the gases to assist regularly in heating the boiler. In fact, the nature of the gases varies at different stages of the operation. At the commencement, it is a mixture of the vapour of water, of sulphurous products, of carbonic oxide, and of different carburets of hydrogen. Now, a mixture of this description could only burn in contact with the air, while the carbonic and hydrogen gases are predominant or in excess, and even then only at a high temperature. This state of things can never take place in the present improved apparatus; because, in the first place, the gases which are first generated are very slightly inflammable; and, in the next place, the oven is cold at the commencement of the operation. In consequence of this, an enormous quantity of gas will escape, unconsumed, in the form of a thick smoke, during the first few hours of the operation; and the gases will not burn in contact with the air until they are more hydrogenated, and the ovens and flues become red-hot, which will not take place for nine or ten hours after the oven is charged. These difficulties, it is stated, are overcome in the following manner:—In the first place, the coke ovens are charged at different periods, so that they may be at different states of carbonization; and secondly, all the disengaged gases and vapours are directed into a common receiver, so that the carbonic acid, which escapes in abundance from the ovens that are just ignited, becomes mingled with streams of hydrogenated gases, more or less carbonized, and issuing from the ovens that are in full work. Then the carbonic acid, which predominates in the gases arising from the ovens that are just commencing operation, is converted into carbonic oxide, and the water into hydrogen, under the influence of the high temperature of the receiver, which is constantly maintained at a light red heat. In order to render the operation complete, and to effect the regular combustion of the carbonic oxide gas and of the carburetted hydrogen, it will be necessary to ascertain the volume of air that is required. The volume of air that will be required cannot be determined very exactly, owing to the variation of the quality of the coals, and of the composition of carbon, oxygen, hydrogen, and foreign matters; it will therefore be necessary to make some experiments before putting the apparatus into full operation. If the volume of air is properly regulated, the heat produced will be sufficiently great to actuate powerful engines with a regularity equal to that of the best furnaces.

The various figures in Plate VII., represent the improved apparatus for obtaining the above results.

The coke ovens employed are 24 in number, forming two sets of 12 ovens each. The quantity of steam generated by means of the waste heat derived from this apparatus, will be sufficient to actuate two steam-engines, of 60 horses' power each. The apparatus may be composed of a greater or lesser number of ovens, so as to be able to drive an engine of greater or less power. The coke ovens are arranged in the manner shewn in figs. 1, 2, 3, and 4. Fig. 1, represents an external side elevation of the improved arrangement, in which 24 ovens are employed. Fig. 2, is a longitudinal vertical section, shewing the sectional profile of the coke ovens, and the means of applying the waste heat to generate steam in the steam boilers. Fig. 3, is a transverse or cross section; and fig. 4, a horizontal section or plan view of the same, as seen from above.

The ovens are seen at A^1, A^2, A^3, A^4, &c. They are constructed, internally, of fire-bricks; and their form, as seen from above, is that of an ellipse, the longest diameter of which is about 4 yards, and the shortest diameter about 3½ yards. Fig. 8, represents a section of one of the ovens, taken longitudinally, or in the line of its greater diameter; fig. 9, is a section of the same, taken transversely, or through the shorter diameter; and fig. 10, represents a horizontal section, shewing the ground plan of the oven. The roof of the oven is arched or curved, and the height of the perpendicular sides, up to the point where the spring of the roof commences, is about 20 inches; from the floor or bottom of the oven to the summit, is about 42 inches. The flooring of these ovens is constructed of two rows or layers of bricks: the first or upper layer consists of fire-bricks, and the other layer of ordinary bricks. The roof is also constructed of fire-bricks, and at the uppermost part thereof five holes or orifices are made, of about 12 inches diameter at the inner ends, and about 10 at their outer ends. The gases pass through these holes or openings, for the purpose of heating a small auxiliary boiler, situated above the roof. The heat is reflected on to the upper surface and sides of this small boiler by means of an additional arched roof, which is placed above, and partially surrounds, this boiler, leaving a clear space round it for the gases and heat to circulate; the gases then pass off, by conduits or ways, into a longitudinal retort or furnace. These conduits, which bring the gases resulting from the carbonization of the coke to the retort, are marked on the drawing with the letters B, B, B, B: they are made of fire-bricks; and their openings or terminations in the longitudinal retort are so arranged, as not to be opposite each other.

Pipes M, M, convey air (submitted to a pressure of four atmospheres, by means of an air-pump), for the combustion of the carbonic oxide gas, and of the hydrogenated carburets. Atmospheric air may also be supplied from the receivers *y*, *y*, (see fig. 11,) through the small orifices *p*, *p*, to the chambers *z*, *z*, for the purpose of burning or consuming the gases in a perfect and complete manner. The communication between the ovens and the vent pipes or flues is arranged as follows:—The longitudinal retort or flue K, (figs. 2, and 4,) receives the gases generated in the ovens 7, 8, 9, 10, 11, and 12, by means of branch pipes or conduits B, B, B, B, and conveys them, in a state of combustion, into the tubes D^4, in the large boiler, as seen in figs. 3, and 4. The gases circulate through the entire length of these tubes, and pass from their opposite ends, into the lateral flue D^1; they then return along the pipe E^2, and ultimately escape into the part O^2, of the chimney; which is divided into four portions, each about 20 inches square, so that each section should correspond to one of the side pipes or flues E^1, or E^2. The chimney is divided in this manner only a short distance up. The branch pipes or conduits B, B, of the other six ovens, convey the gases from the ovens into the flue D^3, below the boiler, as seen in the cross section, fig. 3; and, after having passed along this flue, they rise up, and enter the side flue D^2, and from thence pass along the long flue E^1, into the compartment O^1, of the chimney.

When the steam-engine is not working, and consequently when it is not necessary to produce steam, instead of causing the gases to pass into the lateral flues D^1, D^2, the bottom flue D^3, and the tubes D^4, they are conveyed directly into the flues E^1, and E^2, and from thence into the chimney, without acting upon any of the boilers. To effect this object, the communication between the ovens and the flues D^1, D^2, and D^3, and the tubes D^4, must be cut off, which is done by closing the damper T, at the end of the longitudinal flue K, thereby preventing the gases from entering the tubes D^4, and also closing the dampers of the ovens 1, 2, 3, 4, 5, 6, to cut off the communication between the ovens and the flues D^2, and D^3; then, by opening the small damper T^2, also situate at the end of the longitudinal flue K, as seen in fig. 4, the gases of the ovens 7, 8, 9, 10, 11, and 12, are carried direct into the side flue E^2, and from thence to the chimney; at the same time the damper or register T^3, of the other ovens must be opened, so as to allow the gases to issue directly into the flue E^1. The draught of each oven may be regulated by a damper or register T^3, adapted to the vent way, as seen in fig. 3*. The draught in all the ovens may be stopped, by closing the large damper T, at the end of the longitudinal flue K. This damper may also be employed to regulate the heating of the boiler. The boilers are made of sheet-iron, of a cylindrical form, and may be made to act at either high or low pressure.

While the engine is working regularly, the level of the water in the boiler must always be maintained at some height above the tubes D^4. The space for steam is greatly augmented by the dome R, placed above, from whence the steam may be taken. The boiler may be cleaned by means of the reservoir K^{11}, which is not heated. Small auxiliary boilers I, are placed, as before mentioned, under the arch of the roof of each oven, and at a very short distance therefrom. These boilers rest, at one end, upon a support set in the masonry or brick-work, and the other end is supported upon the plate J, (see fig. 3); they may be placed either inside the oven, or altogether outside, as shewn in the drawing. They are furnished with tubes L, for the conveyance of the steam, and for supplying them with water, which is effected by the water in the large boiler being always at a higher level: these tubes are inclined, as represented in fig. 2, and are each of them furnished with a stop-cock. Of course, when it is not required to generate steam, the gases must be prevented from acting upon the small boilers I, which is done by simply closing the vent-holes, by means of the damper T^3, which also opens a direct communication with the flue, as already described, and is clearly shewn in fig. 3*.

Q, Q, fig. 3, are pipes for supplying the first two auxiliary boilers of each set; R, R, are stop-cocks for emptying these auxiliary boilers when required; P, are the oven doors, made of cast-iron, and furnished at their inner sides with fire-bricks; E, is a cast-iron foundation, on which the ovens are built; W, W, is a receptacle for the soot from the chimney, which is cleansed from below: the soot being discharged through a door or opening W^1, into the arched chamber X, from whence it may be removed when convenient.

Fig. 5, represents a plan view; and fig. 6, a transverse vertical section of another arrangement, in which only four coke ovens are employed. V, is a chamber into which the gases arising from the four ovens are conveyed by pipes; the ovens are furnished with small auxiliary boilers, which are heated by the passage of the gases, as in the former instance. These gases pass from the chamber V, through the vertical tubes Z, thereby heating the water in the main boiler, and they ultimately escape into the chimney O^1. In this arrangement it will be seen that two small cylindrical boilers are adapted to each oven.

Fig. 7, represents another mode of generating steam; in this boiler the gases do not pass into the tubes n^1, but between them, and after having heated the tubes, which are filled with water, they ultimately escape into the chimney O^1, where they assist in keeping up the temperature of the steam in the steam-box. This boiler may be employed in place of the one shewn at fig. 6, and even upon the same foundation, without any alteration.

The patentee claims the peculiar mode, above described, of generating steam in steam-boilers: viz., by connecting a series of ovens together, and conveying the gases arising therefrom into one common flue, where the unconsumed carbon, driven off from a fresh supply of coal in one or two ovens, is burnt or consumed by the heated gases arising from the ovens, in a more advanced stage of carbonization. He also claims the employment of small auxiliary boilers, in the manner and for the purposes above mentioned.—[*Inrolled in the Petty Bag Office, February,* 1845.]

Specification drawn by Messrs. Newton and Son.

To Thomas Heaton, *of Chorley, in the county of Lancaster, colliery agent, for his invention of certain improvements in hydraulic machinery, which are also applicable to raising other liquids.*—[Sealed 15th August, 1844.]

This invention applies particularly to hydraulic machinery, such as pumps or engines, employed for raising or forcing water from mines, pits, &c.; but it is equally applicable, in principle, to manufacturing and domestic purposes, and especially for ships' uses, fire-extinguishing engines, and similar purposes, where water or other fluids are required to be displaced.

The first feature of novelty consists in the application of a hollow ram or plunger, which may be of an equal area with the working barrel, either more or less, engaged either in connection with a common or the improved bucket, hereafter described, in place of the ordinary pump-rod or connecting-rod. This application of a hollow ram or plunger to pumps, or other hydraulic machinery, for raising and forcing water and other fluids, is for the purpose of displacing a considerable quantity of the volume of fluid above the bucket, as the bucket descends; and by thus removing the weight of fluid above the bucket, greatly economizing the power required, and reducing the strain upon the working machinery of the primary moving power. It will also be evident, that as the object of this ram is to displace a large quantity of water, a wooden ram, of a similar diameter, might be adapted in lieu thereof.

Secondly,—these improvements in hydraulic machinery consist in the novel application or employment of a double set of valves to the clacks and buckets of pumps, for certain useful purposes, hereafter described. And thirdly,—the invention consists in a particular method of packing either the bucket, the working-barrel, or other parts of pumps, by the novel application of a material now well known as "Jeffery's marine glue;" the use of which for such purposes is particularly advantageous, whether it be employed alone, or combined with filings of brass or other metal, layers of leather, or other substances*.

In Plate IX., fig. 1, represents a sectional elevation of the working parts of a pump, in connection with pump-trees, above and below, and supposed to be employed for raising water from a mine, well, cistern, or other reservoir; fig. 2, is a similar sectional view, but exhibiting some modifications in the internal arrangement; fig. 3, is a transverse section, taken through the pump, at the line A, B, in fig. 1, shewing a plan view of the top pair of valves of the bucket and the stuffing-box; and fig. 4, is a similar view, taken through the line C, D, shewing the bottom pair of valves of the bucket. *a, a,* is the working barrel of the pump; *b, b,* the bucket; and *c, c, c,* the pump-trees, extending upwards and downwards from the working barrel; *d, d,* is the hollow ram, which extends upwards from the bucket (in place of the ordinary connecting-rod) to the top of the pump-trees; the upper end of this ram being closed, a cylindrical air-vessel, occupying a very considerable portion of the area above the bucket, is formed, and a corresponding volume and weight of fluid is consequently displaced. It will be observed, that the bucket *b, b,* is furnished with two sets of valves or bucket-lids *e, e,* and *f, f,* so that, should one of the valves be prevented from closing by a piece of wood, a stone, or any other substance (which is very liable to be the case in working from a bad bottom), the other valve may close, and raise the water, while the down stroke of the bucket will be sure to clear away the impediment. The clack-piece *g, g,* is also furnished with two sets of valves or lids *h, h,* and *i, i,* for the same purpose;

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* For description of this invention, see Vol. XXI., C.S., p. 371.

which clack and bucket-lids may either be hung upon hinges, as shewn in the drawing, or be made to rise and fall separately upon spindles or slides. It will be observed, that doors or plates are provided, for the purpose of readily obtaining access to both the buckets and the clacks; thus admitting of their being cleaned or put in order, as occasion may require. *k*, *k*, are the bucket-doors, and *l*, *l*, the clack-doors.

The peculiar method of packing hydraulic machinery is represented in two separate modifications, at figs. 1, and 2; that in the former being enclosed by a glandular ring, in the concentric groove *m*, *m*, *m*, (the pump-barrel thus completely surrounding the bucket, which, in this case, is lengthened, to allow of such mode of packing); and that in fig. 2, being shewn in a reverse position, or placed in the groove *n*, *n*, turned in the bucket, and thus forming the packing between it and the working barrel. In both instances the spaces between the grooves *m*, and *n*, are to be tightly packed, either in the common way or with "Jeffery's marine glue." This composition, the patentee states, will be found most efficient for such purposes; it consists of caoutchouc dissolved in conjunction with shellac, and is highly elastic, and quite impervious to the passage of water.—[*Inrolled in the Petty Bag Office, February*, 1845.]

Specification drawn by Messrs. Newton and Son.

To FRANCOIS STANISLAS DE SUSSEX, *of Bethnal-green, in the county of Middlesex, chemist, and* ALEXANDER ROBERTSON ARROTT, *of Torrington-square, in the same county, chemist, for improvements in the recovery of manganese, used in making bleaching powder.*—[Sealed 29th August, 1844.]

THESE improvements consist in producing peroxide of manganese, more or less pure, from salts and other combinations of that metal which contain it in a lower state of oxidation.

By this invention, the residuum that is left after the disengagement of chlorine or oxygen from manganese, and which is a product of little or no value, can be converted into a substance of great value, viz., that of superoxide of manganese, which is peculiarly fitted, by the large proportion of oxygen it contains, to serve the purpose of affording either chlorine or oxygen gas again, according to the process it is subsequently subjected to. The said residuary matters, after the extrication of the chlorine, in the manufacture of chloride of lime, or bleaching powder, and of chlorate or hyperoxymuriate of potash, consist principally of chloride and sulphate of manganese; but, as these residuums may and have been occasionally converted, more or less, into sulphuret of manganese, when they are used to purify coal gas from its sulphur or sulphuretted hydrogen, the patentees include, not only the above sulphate and chloride, but also the sulphuret of manganese, among the waste or refuse products, which they convert into a valuable peroxide of that metal. This invention is also applicable for converting all oxides, carbonates, and other combinations of manganese, whether native or factitious, which contain the metal in an inferior state of oxidation, into a superoxide of manganese, adapted to produce chlorine by the agency of hydrochloric acid, and oxygen by the agency either of heat alone, or of heat along with sulphuric acid.

The manner of carrying this invention into execution is as follows:—The conversion of manganese, whether combined or uncombined, from a lower state of oxidation into the higher state of superoxide, is effected by two distinct operations. First, it is well known that when peroxide of manganese, (called, in its purest native state, pyrolusite, and also grey manganese ore,) is digested with hydrochloric or muriatic acid, the oxygen of the metal combines with the hydrogen of the acid to form water, and leaves the chlorine of the acid free, while the manganese, thus partially stripped of its oxygen, combines with the rest of the hydrochloric acid to form a muriate of manganese: likewise, when more or less dilute sulphuric acid, common salt (chloride of sodium), and peroxide of manganese, are so mixed and treated as to be made to re-act on one another, the hydrochloric acid which is disengaged, is converted by the oxygen of the manganese into water and chlorine; while both the soda, produced from the common salt, and the partially deoxidized manganese, combine with the sulphuric acid into sulphate of soda and sulphate of manganese. The chloride, sulphate, sulphuret, or carbonate, is converted into a sesquioxide or deutoxide of manganese, by one or other of the three following processes:—First, the dried chloride of manganese is subjected to a strong heat, produced either by the united action of burning fuel, and a jet or jets of an oxyhydrogen blowpipe, or of a stream of atmospheric air thrown upon the burning fuel by a fan or other suitable impulsive power, thus forming a kind of blowpipe or blast-furnace, in which the chemical decomposition and reaction are rendered quicker and more complete. The furnace is constructed like an ordinary reverberatory furnace, with the addition of a box or chest of iron, open at top, set in the fire-place, close to the bridge; this box is filled with iron turnings, borings, or other small fragments of iron, upon which, in their strongly ignited state, water is allowed to trickle or drop down slowly from a pipe, so as to be decomposed, and to disengage a stream of hydrogen, which is impelled over the bridge of the furnace upon the hearth by means of a fan or other blowing machine, acting at the entrance or door of the fire-place. The manner in which the furnace is regulated is as follows:—The fuel, either common coals, coke, anthracite, wood, turf, &c., is first lighted upon the grate, and being subjected to the blast of air, soon creates such a temperature as to raise the box of iron turnings to a red-white heat, in which state the water being allowed to trickle down into the box, is decomposed, with the copious disengagement of hydrogen gas. The chloride of manganese may be exposed on the hearth of the reverberatory furnace, either in a more or less concentrated liquid state, or in a dry state, to the action of the intensely powerful flame, generated as above described, and becomes thereby decomposed by the hydrogen, with the disengagement of its chlorine in the state of hydrochloric acid or muriatic acid gas, while the remaining protoxide of manganese becomes at the same time oxidized into the deutoxide. The hydrochloric acid gas disengaged is condensed by means of vaults or large chimneys, containing wet coke or flint nodules, in the way often practised in soda manufactories. Instead of the above described hydrogen flame, a simple reverberatory furnace, fed with ordinary fuel, either with or without blast, is sometimes employed.

In the second process, the chloride of manganese, instead of being acted on by the flame of combustible matter on the hearth of a furnace, is subjected, in fire-clay retorts, to an intense heat, by which the chlorine is expelled, partly in the state of hydrochloric acid, and partly of chlorine; and the manganese left in the retorts may be afterwards peroxidized by a process to be presently described.

In the third process, chloride of manganese and carbonate of lime, or quicklime, are mixed together in the proper equivalent proportions for mutual decomposition, and then subjected to the strong heat of the above-described compound hydrogen flame; by this means a mixture of chloride of calcium (muriate of lime) and oxide of manganese is obtained: the latter is peroxidized by a process about to be described. Magnesia, or magnesian limestone, may be substituted for lime, or its carbonate, in this process. When the carbonate of lime is used with rather too low a heat in the furnace, carbonate of manganese may be formed. In all cases the resulting mixture of chloride of calcium or magnesium, and oxide of manganese, is to be treated with water, so as to dissolve out the said chlorides, and leave the oxide of manganese.

The following is the mode of decomposing sulphate of manganese, however formed, so as to obtain from it an oxide of manganese, to be peroxidized by an after process:—The sulphate of manganese is mixed with saw-dust, ground coke or charcoal, or any like combustible matter, only in such proportion as to be capable of decomposing the sulphuric acid present, when the mixture is subjected to a strong calcining heat, in retorts of iron, or fire-clay; whereby a sulphuret of manganese is obtained, mixed with more or less oxide of manganese. This operation is finished by introducing into the said residuary mixture fragments of coke, charcoal, or coal, and continuing the application of heat for some time, while the mouth of the retort is left open; whereby the manganese is desulphurated in a greater or less degree, and its sulphuret is converted into an oxide. In case any salt, or other compound of soda, should have been mixed with the sulphate of manganese, the soda compound is to be separated from the manganese, by means of water, after the above-described calcination in the retorts. The sulphuret of manganese sometimes produced in coal gas works, as a residuum of the purification of the gas, may be desulphurated in retorts, as above described, or by exposing it, mixed with pieces of coke, charcoal, coal, or wood, on the hearth of the above-described reverberatory hydrogen furnace. The coke, &c., should be used in distinct pieces, and not in powder, whereby it may be readily separated from the oxide of manganese afterwards, either by a sieve or other suitable means.

The second operation, or series of operations, for converting the deutoxide of manganese, produced in the before-described processes, as also all lower oxides and the carbonated oxide of manganese, whether natural or factitious, into a superoxide, fit for affording chlorine by the action of hydrochloric acid, and oxygen by heat, is carried on in one or other of the three following ways:—First, the said oxides or carbonates are converted from their lower to the much higher state of oxidation of an acid of manganese, by subjecting a mixture of them with alkaline matters, such as potash or soda, either caustic or carbonated, on the hearth of a reverberatory furnace, to the joint agency of heat and atmospherical oxygen, which may or may not be impelled and diffused by mechanical means: about one part of the oxide or carbonate of manganese, mixed with about three parts of alkaline matter, forms a suitable proportion for the production of an acid of manganese. The said mixture fuses, with the production of a manganate or permanganate of potash or soda, according as one or other alkali has been used in the mixture. The fused mass is run or ladled out of the furnace, and, when cooled, is dissolved in hot water. This solution, of what is sometimes called chameleon mineral, on being exposed freely to the air, becomes decomposed, by the absorption of carbonic acid gas, into peroxide of manganese, which precipitates in a black powder, and carbonated alkali, which remains in solution. Where carbonic acid gas can be conveniently procured at a very cheap rate, the above-described decomposition of the chameleon mineral may be promoted by a due application of the said acid gas. Or, otherwise, the alkaline bicarbonates obtained from a preceding decomposition of chameleon mineral, may be employed for decomposing a fresh-made solution of the said chameleon, whereby a precipitate of peroxide of manganese is immediately obtained. The supernatant alkaline liquor is in all cases decanted or run off, and preserved for subsequent use. The patentees also decompose chameleon mineral, with the production of peroxide of manganese, by the action of various organic products, such as starchy or gummy matters; but they greatly prefer to effect the desired production of peroxide of manganese by carbonic acid gas, or an alkaline bicarbonate.

The second method of producing peroxide of manganese from its lower oxide or carbonate, consists in subjecting a mixture of about one equivalent chemical proportion of either of these, and about one equivalent of lime, to the chlorine expelled by heat from chloride of manganese contained in the retort, as before described. Or, by treating one equivalent proportion of that lower oxide of manganese, called by chemists sesquioxide or deutoxide, with one half of an equivalent proportion of aqueous or liquid hydrochloric acid, there is obtained, simultaneously, one half of an equivalent proportion of protochloride of manganese, in solution, and one half an equivalent of peroxide, in the state of a black powder. A like reaction, with the production of a solution of protochloride of manganese, and black peroxide, may be effected, by treating the said sesquioxide with aqueous hydrochloric acid, in one vessel, and transmitting therefrom the chlorine disengaged into another vessel, containing a like sesquioxide in a moist state.

The third method of converting the lower oxide or carbonate into peroxide of manganese, consists in directing over the surface of either of these, in a moist state, the deutoxide of azote, frequently called nitrous gas, which is obtained as a waste product in certain chemical operations, as in the manufacture of oxalic acid, or nitrate of lead, or of copper, &c.; in this case the nitrous gas becomes reduced to a lower state of oxidation, and, by imparting oxygen to the lower oxide of manganese, converts it into peroxide.

The patentees claim the production of peroxide of manganese from the lower oxides of that metal, by the several methods hereinbefore described.—[*Inrolled in the Inrolment Office, February,* 1845.]

To WILLOUGHBY THEOBALD MONZANI, *of Wellington-terrace, Ramsgate, Gent., for certain improvements in the construction of boats for the preservation of life and property, and in apparatus applicable thereto.*—[Sealed 3rd July, 1844.]

THESE improvements in the construction of boats, for the preservation of life and property, and in apparatus applicable thereto, consist, firstly,—in a peculiar method of forming, connecting, and fitting together certain parts, so as to produce a skeleton boat, by the combination of a bottom, or platform, with frames and supports (to which flexible air-chambers may be attached); the outer part or hull of the boat being produced by a casing of canvass, or other suitable material, rendered as nearly waterproof as practicable: which boat, so constructed, will be capable of collapsing, for the purpose of stowage, in a comparatively small space, and of being readily opened out and prepared for use. Secondly,—in a novel construction of rudder, the outer part of which is enabled to rise and fall upon joints, or in grooves, in order to prevent the derangement or fracture of the rudder, in the event of its striking upon a rock, or coming in contact with the ground.

In Plate IX., fig. 1, represents a horizontal view of the skeleton boat; fig. 2, a longitudinal section of the same; and fig. 3, a transverse section. *a, a, a,* is the horizontal platform, made of wood, or of other suitable material. The platform is constructed of a double or treble series of wooden planking, of oak or ash, so connected that the grain or fibres of the upper, lower, and central boards (if there be three courses), shall cross each other; the whole being braced by bars of iron, or other secure mode of fastening. This platform must be made firm, as it has not only to sustain the burden to be carried in the boat, but also to support and hold securely the framing of which the boat is constructed. The gunwale of the boat is formed by a strong rail *b, b, b,* of wood, or of some other suitable material, which is to extend entirely round the upper edge of the boat, in one connected piece or frame, and which is braced firmly by transverse thwart-rails or bars *c, c.* A similar rail or frame *d, d, d,* of rather smaller compass than the former, and braced together, in like manner, by transverse rails *e, e,* is intended to extend round the boat at about midway between the bottom or platform and the top rail or gunwale, as shewn in figs. 2, and 3. These two rails or frames *b,* and *d,* are connected to the platform *a,* by strong flexible straps, made of broad flat ropes, or other suitable materials: or chains would answer the purpose. The straps *f, f, f,* connect the upper rail *b,* with the platform *a*; the straps *g, g, g,* connect the lower rail *d,* with the platform *a*; and the straps *h, h, h,* connect the upper and lower rails together. When the two rails *b,* and *d,* are lifted up from the platform *a,* as high as the lengths of the straps will allow, the levers or stauncheons *i, i, i,* are to be raised upon their hinge-joints, and brought under the respective thwarts of the rails, for the purpose of supporting them, and keeping the skeleton frame-work distended; and also the ends of the frame-work may be made more firm by means of struts *k, k.* The outer coating or canvass, which is to cover the skeleton, must be very securely fastened round or under the edge of the platform, and also round the edge of the gunwale-frame; so that, when the frame-work is expanded, the covering may resemble the hull of a boat, and be proof against the admission of water to the interior.

Fig. 4, is a side view of the improved boat in its distended form; and fig. 5, is an end view of the same, as described above, and ready for use, having longitudinal air-vessels or air-bags *o,* attached to its sides. When the boat is out of use, and required to be stowed away, the air-vessels being removed, the struts *k,* must be displaced, and all the stauncheons or levers *i, i, i,* let down; when the flexible straps *f, g,* and *h,* will allow the frames *b,* and *d,* with the canvass covering *j, j,* to collapse and fall together upon the platform *a,* into the compact state shewn in the edge view, at fig. 6.

In constructing the moveable frames, and their thwarts, which are to form the skeleton of the boat, the patentee does not confine himself to making them of wood, as iron rods might be combined and bent round to the required figure; or whalebone, and some other materials, might be found to answer the purpose; but it must be made into a firm structure, and if slightly elastic, will best resist any shocks to which the boat may be subjected. The outer coating may be of any strong flexible material, stout canvass or sail cloth for instance, well paid with oil and other waterproof matters, as solutions of India-rubber; or of the material called Macintosh cloth, or of some kinds of leather, painted or varnished to resist water. The stauncheons *i, i, i,* are made of iron rods, bent into semicircular or segmental shapes; their ends being turned at right angles, to form axles or pivots, which work in staples, fixed in the floor or platform, and so constitute hinge-joints. These stauncheons, when the boat is required to be used, are readily raised and brought up under the thwart-pieces of the framing, where, coming against stops, with springs or bolts, they form sufficient supports to keep the moveable frame-work, or skeleton of the boat, distended and firm. The struts *k, k,* have each a shoulder, or fork, at the upper end, to bear against the under edge of the top frame, and are wedge-formed at bottom, to fit sideways into a chock or block, fixed on the floor or platform. If it should be required to cover a portion at each end of the boat, so as to form a sort of false deck, or secure place for luggage, the struts may then be otherwise fitted, at the discretion of the boat-builder. Chocks are to be affixed to the upper frame *b,* in such places as may be required to insert pegs or forked rowing-pins *l.* On the sides of the boat at the bottom, that is, to the edge of the platform, are to be attached strong cords, chains, or flexible straps *m,* which are passed through staples *n,* fixed in the outer parts of the frames *b,* and rings or links *p,* sewn or otherwise very securely attached to the canvass covering *j,* for the purpose of attaching air-vessels or bags *o,* to prevent the boat from sinking, should it become filled with water. Air-bags being commonly attached to life-boats, or life-rafts, are not considered as part of the invention, but they are used as necessary appendages under some circumstances. The construction of air-vessels preferred, are those made of prepared canvass, or other material similar to the casing of the boat, and of cylindrical forms, with wooden disc-shaped partitions, having small apertures for the passage of the air from one compartment to the other, and with a stop-cock or plug at one end, as shewn attached to the boat in figs. 4, and 5. These cylindrical bags, when opened out or distended, fill themselves with air through the open stop-cocks or plug-holes, which being then closed, confine the air within. These canvass bags, when so filled with air, are to be attached to the sides of the boat by means of the outer straps *m*, drawn tight, and made fast to the top rails; and the ends of the bags are connected together by ropes or small chains, secured to the upper rail near the head and stern.

The second part of the invention, viz., an improved construction of rudder, is represented in the accompanying drawing, at figs. 7, and 8. *a, a*, is the stern-post of a vessel; *b*, the rudder, swinging by its pintles and gudgeons, or by any other convenient or ordinary means. This rudder has the part *d*, made moveable, and capable of rising and falling upon lever-arms or joint-straps *e, e*. The weight of the part *d*, will be sufficient to keep it down, as in fig. 7; but should the stern of the vessel strike upon a rock, or take ground, the part *d*, will rise upon its lever-joints, as shewn in fig. 8.

The patentee claims, Firstly,—the peculiar mode of constructing a skeleton boat, as described above; and Secondly,—enabling the hinder portion of a rudder to rise and fall, in the way described, for the purpose above set forth.—[*Inrolled in the Petty Bag Office, January,* 1845.]

Specification drawn by Messrs. Newton and Son.

To Alfred Simpson, *of Farnham-place, Gravel-lane, Southwark, hat manufacturer, for improvements in the manufacture of hats.*—[Sealed 12th September, 1844.]

These improvements consist in the application of certain stiffening compositions to the bodies of silk and velvet hats, made either of "stuff," wool, or other felted material, or of a light woven fabric,—in the use of metal blocks, and certain other metal articles, which are rendered necessary by the great heat required when these compositions are employed,—and in using what is called, in the straw-making trade, "tissue straw," for making the tips or tops of hats.

The compositions are two in number:—the first is made by boiling together slowly, for about six hours, 40 gallons of linseed oil, 29 lbs. of crude litharge, 27 lbs. of powdered Turkey umber, 19 lbs. of white lead, and 5 lbs. of china clay, sifted very fine; the mixture, when cold, being thinned, if necessary, with turpentine. The second composition, which is for the finer sorts of silk and velvet hats, is made by adding 6 quarts of the first composition, in a boiling state, to 8 oz. of gum copal (any other gum, gum-resin, or resin that will mix with oil, will do as well), which have been previously melted in an iron pot; they are well stirred together, and the mixture is thinned, if required, with turpentine. Both compositions are used about the thickness of cream.

The mode of carrying out this invention, as regards wool or stuff hat-bodies, is as follows:—The hat-body is first blocked on a block of sheet-iron; after which, it is dipped in water, and drained for about a minute; it is then coated with one of the above compositions, by means of a common paint-brush. In Plate IX., fig. 1, represents an iron band, to be fastened, by means of a thumb-screw *b*, around that part of the body where the hat-band is worn, to keep it in shape whilst drying; the body (having the sheet-iron block still within it, as shewn by the dotted lines *c, c,* in fig. 1,) is placed on a curved sheet-iron plate *d*, represented in plan view at fig. 2, and that part which is to form the brim is spread out upon the plate: the brim, however, is not to be coated with either of the compositions, but stiffened, and finished in the usual manner. The body is now subjected to a heat of not less than 175° Fahr., for six hours, in the drying stove; after which, it is taken off the sheet-iron block, by the aid of the iron tool *e*, fig. 3, placed on a wooden block, rubbed with pumice stone, to make it smooth, and pasted over with common hatters' paste, made of flour, resin, bees' wax, and water.

it is then varnished with common hatters' varnish, and the silk or velvet is applied, and the hat finished in the ordinary manner.

In manufacturing hats, which are wider at the top than at that part where the hat-band is placed, the block is made by bending a piece of sheet-iron into the proper shape, as shewn in the perspective view, fig. 4; forming a flap or ear *f*, upon one of the edges, with two slots in it, to receive two screw-pins, situated near the other edge. Upon each screw-pin a nut is placed, and, by screwing these tight, the block is kept to the required size; but when it is required to be withdrawn from the hat-body, the nuts are unscrewed, and the block is squeezed or pressed, so as to lessen its diameter, and thus admit of its being withdrawn.

When the hat-bodies are made of woven materials, commonly called gossamer, the following is the mode of operation:—The woven material, of which the side of the body is to be made, is dipped into water, and brushed over on both sides, in its wet state, with one of the compositions before described (but neither the top of the hat nor the brim are coated with the composition); the metal block is then prepared for it, by being rubbed over with sweet oil, in order that there may not be any adhesion; and, to prevent the oil from damaging the woven material, the block is wrapped round with thin paper, or thin silk. The side of the body is then framed upon the block, and exposed to a heat of 175° Fahr., in the drying stove, for three hours; (in making this kind of hat, the iron band and curved sheet-iron plate are not used, because the brim is added afterwards, in the ordinary way); at the expiration of this time, it is removed from the stove, and taken off the block, while warm, by means of the iron tool; if paper has been used to wrap round the block, it will come off adhering to the side of the body, and remain attached to it, and must be treated with Fuller's-earth, or other detergent material, to remove the grease; but if silk has been used, its texture is sufficiently strong to admit of being stripped off while warm. The side of the body is now blocked on a wooden block, the tip or top fastened on, the brim added, and the hat finished in the usual manner; except that sometimes the patentee makes the tip or top of the material known in the straw-making trade as tissue straw.

The patentee claims, as his invention, Firstly,—the application of the compositions for stiffening hat-bodies, hereinbefore described, in the manufacture of silk and velvet hats, whether the said bodies be made of what is called stuff, or wool, or other felted material; and also the application of such compositions to the sides of gossamer hat-bodies, made of any suitable light woven fabric. Secondly,—the use of a sheet-iron or metal block, a sheet-iron or metal curved plate, an iron or metal band, and an iron tool, as hereinbefore described; all of which are rendered necessary in the manufacture of such of the hats as are not called gossamer hats; and the first and last of which are rendered necessary in the manufacture of those called gossamer hats, by the high degree of heat used when the said compositions are applied. Thirdly,—the use of "tissue straw" in the manufacture of tips or tops of hats.—[*Inrolled in the Inrolment Office, March,* 1845.]

To JOSEPH MARTIN KRONHEIM, *of Castle-street, Holborn, in the city of London, engraver, for an invention of improvements in stereotyping,—being a communication.*—[Sealed 29th July, 1844.]

THESE improvements are designed to facilitate the operation of obtaining stereotype metallic plates from any pages or forms of combined types, or other raised printing surfaces; and consist, firstly,—in an improved method of forming from types, or other raised printing surfaces, matrices or moulds, in which the stereotype plates are to be cast; and secondly,—in apparatus for holding the said matrices, and performing the operation of casting the stereotype plates.

The mode of carrying out these improvements is as follows:—The page or form of combined types, or other printing surfaces, being prepared and secured in close contact, in the ordinary way, such page or form of types, or other raised printing surfaces, is laid (its back downwards) upon a flat table, for the purpose of taking an impression therefrom, in counter-relief, with a plastic composition of the following ingredients, and in the proportions of each as below stated:— About six and a half pounds of wheaten flour are mixed with about nine and a half pounds of starch, which, with the addition of about four pints of water, and a quarter of an ounce of alum, well incorporated, are to be boiled in the usual way, and thereby made into paste. When this paste has become cold, to every four and a half pounds of it four pounds of finely pulverized whiting are added, and the whole is passed through a fine sieve, or between a pair of rollers, to insure a thorough plastic combination of the materials.

With this composition, as a paste, three or more sheets of thin tissue paper are attached to one of stout brown paper, which produces a thickness of materials called a flanc; this flanc is placed in a press, in the ordinary way of making pasteboard; and after three or four days, becoming partially dry, it is ready for use. The page or form of types, or other printing surfaces, having, as above said, been placed upon a flat table, must be locked up or secured in a chase, by metal furniture, or other suitable means, and the faces of the types properly cleaned. Then upon the face of the form of types, or other printing surfaces, the flanc, in a damp state, is to be laid evenly, and the back of the flanc beaten upon gently by the bristles of a brush, for the purpose of forcing or matting the plastic material of the flanc into the inequalities or indentations in and between the faces of the types, or other printing surfaces. In this situation the flanc is to remain, and be pressed upon equally all over its back by flat weights or plates of metal, which are preferred to be perforated with many small holes, in order to allow of the moisture of the damp flanc evaporating readily. When perfectly dry, the flanc has become a hard matrix, flat at its back, and indented on its face, in counter-relief, to the form of types, or other printing surface, upon which it has been pressed; and it is then ready to be employed as a mould or matrix, in which type metal may be cast to produce a stereotype plate, corresponding to the form of types, or other printing surfaces, upon which the flanc has been impressed. In order to cast stereotype plates from this matrix, it is fixed in an apparatus, shewn in several views in Plate IX. This apparatus consists of a suitable frame or stand, upon which the mould and its appendages are mounted. Fig. 1, represents it in horizontal view, as it would appear from above; fig. 2, is a horizontal view of the apparatus, the mould being thrown open; and fig. 3, is a vertical section, taken through about the middle of the apparatus, the mould being here shewn closed, and in the position for casting.

The wooden frame-work *a, a, a,* supports a bench, or strong table *b,* to which iron brackets *c, c,* are made fast, for the purpose of carrying the axle or pivots *d, d,* whereon the mould-box *e, f,* with its carrier-frame and appendages, turn, as seen in fig. 3. The mould-box consists of two flat plates, connected to a sliding hinge-joint *g,* passing through long slots in the hinge-brackets *h, h,* and *i, i,* affixed to the bottom parts of the plates *e,* and *f.* When the mould-box is open, as shewn in fig. 2, the plate *f,* falls back upon its hinge-joint, as represented by dots in fig. 3.

In preparing to cast a stereotype plate, the mould-box must be first heated, in order that the fluid metal may not be chilled suddenly in the act of casting. For this purpose, a hot plate of metal may be introduced between the plates *e,* and *f;* the slots in the brackets *h, h,* and *i, i,* of the sliding hinge-joint *g,* allowing the mould-box to open wide enough for its insertion. The composition matrix should also be warmed. The mould-box, when heated, is laid in a horizontal position, and its upper plate *f,* thrown back, as shewn in fig. 2; and, in order to support the mould-box in that position, a jointed lever or leg *j,* must be brought up under it.

The composition matrix *k, k,* is laid upon the flat plate *e,* and to prevent the casting adhering to the matrix, its surface and interstices should be pounced all over with powder of talc, which must be afterwards carefully blown out clean. Angular strips of metal *l,* and *m,* of about an eighth of an inch in thickness (dependent upon the required thickness of the casting), are then placed upon the face of the matrix, for the purpose of determining the size of the stereotype plate to be cast. The angular strip *m*, being capable of sliding in the socket *n*, so as to regulate or adjust the size of the casting, of which the strips are to define the edges.

The matrix being thus placed upon the horizontal plate *e*, as in fig. 3, and the angular strips *l*, and *m*, laid on the margin of the matrix, the plate *f*, which has been previously covered with paper, must be shut down, for the purpose of confining the matrix, and the strips *l*, and *m*, securely in their places between the plates *e*, and *f*, which now will constitute the mould-box. The horizontal clasp-lever *p*, turning upon its joint *q*, on one arm of the carrier-frame *r*, is then to be brought over the mould-box, and its outer forked or hooked end passed into the notches of the other arm of the carrier-frame *r*, as seen at fig. 1; when the screw-shaft *s*, passed through the clasp-lever, being turned, and its end brought down to bear upon the back of the plate *f*, the plates *e*, and *f*, will be securely confined together, and the mould made ready for the operation of casting. It will now be necessary to place the mould in a vertical position,—to do which, the leg *j*, must be withdrawn, and the mould-box *e*, *f*, with its carrier-frame *r*, and appendages, turned over upon its pivots *d*, *d*, into the situation represented at fig. 3. Two small wedges *t*, *t*, are now to be inserted into the narrow opening of the mould, at its sides, when the mould will be ready to receive the fluid type metal.

The type metal, having been melted in the ordinary way, is to be poured into the mould at the mouth *u*, formed by the bevilled edge at top; which fluid metal, descending by its gravity, will insinuate itself into all the recesses and indentations in the face of the composition matrix, held flat, as before described, against the inner surface of the flat plate *e*; whilst the back of the casting will be made even and parallel to the face by the surface of the plate *f*; which latter, being covered with a sheet of paper, will allow of the air escaping from the mould, as the casting goes on.

The stereotype plate, thus cast in the mould, may, when cold, be removed, by withdrawing the plate *f*, as shewn by dots in fig. 3, and then removing the metal strips *l*, and *m*, and drawing off the matrix *k*. The edges of the plate, if necessary, must then be trimmed and cleared of its "fins," when the casting will be found to be a perfect stereotype plate, the counterpart of the matrix, and ready to be employed as type, or a surface for printing from.

The patentee claims, Firstly,—the composition matrices, made of the plastic materials above pointed out, or by any modification of those means; not intending to confine himself to any particular quality or kind of paper, or to any particular adhesive composition or paste; but intending to use all such animal, vegetable, and earthy materials, as may be found suitable for forming matrices of the kind, and in the way above pointed out. And Secondly,—the apparatus described above and exhibited in the drawings, or any modification of the same, which may effect the object of casting stereotype plates, by the means herein set forth; and whether made of the materials described, or of other suitable materials.—[*Inrolled in the Petty Bag Office, January.* 1845.]

Specification drawn by Messrs. Newton and Son.

To James Pillans Wilson, *of Belmont, Vauxhall, in the county of Surrey, Gent., for improvements in treating fatty and oily matters, and in the manufacture of candles.*—[Sealed 29th August, 1844.]

In treating fatty and oily matters, for the purpose of separating the liquid from the more solid parts, much inconvenience has been experienced from variations in the temperature of the atmosphere; for, when the weather is too warm, a considerable portion of the more solid part of the fatty or oily matters frequently escapes with the oil, thereby diminishing the quantity of solid matter obtained, and rendering the oil liable to solidify. The patentee proposes to remedy this inconvenience, by employing artificial means to produce an atmosphere sufficiently cool.

For this purpose, he constructs a room, eighteen feet high, fifty feet long, and twenty feet broad, with treble walls, and with a double ceiling, and a roof over that; so as to interpose, between the air of the room and the external atmosphere, three solid bodies, and two strata of stagnant air. The windows (five in number) are all double, and double glazed; so as to interpose four sheets of glass, and three strata of air, between the external atmosphere and the air of the room: means are provided for shading the sun from the room; and the sides of the sashes are carefully puttied. Every opening that might permit the entrance of the external air is closed, except the door, which is double, and is made to fit with great exactness. At one end of the room, five hydraulic presses are placed; but they occupy only a small part of the area; the room being of larger dimensions than an ordinary press-room for five presses, because the operations preparatory to pressing, as well as the pressing, have to be carried on therein. A series of strong rafters extend across the room, at a level above the height of the presses, and support four cast-iron cisterns (eighteen feet long, ten feet broad, and four feet deep), placed lengthwise across the room, side by side. From a little below the top of the first cistern, a pipe, six inches in diameter, descends to the bottom of the second; and from a little below the top of the second, a pipe descends to the bottom of the third, and so on; the pipe from the fourth cistern leading into a drain. When a very low temperature is not required, but merely a moderation of the summer heat, a continuous supply of cold water is pumped from a deep well, by a steam engine, into the first cistern; from thence it flows through the other cisterns, in succession, abstracting the heat from the atmosphere of the room, and is at last discharged into the drain. To obtain a lower temperature, ice is thrown into the first cistern; for a very low temperature, ice is put into all the cisterns; and when a still lower temperature is desired, salt is mixed with the ice.

The patentee likewise proposes to carry on the operation of making candles, when the weather is warm or variable, in an atmosphere artificially cooled, in the room described above, or in a smaller room, cooled by one, two, or more cisterns, or other suitable means; and when Morgan's patent candle-making machines are used, the railway, on which the frames travel, is laid through a room or space artificially cooled.

This invention also consists in certain other improvements in making composite candles (which are composed of a fatty acid, mixed with the stearine of cocoa-nut oil, or other unacidified fatty material); and in manufacturing fatty acids for making composite and other candles.

The patentee states that, if distilled fatty acids are used in making composite candles, either combined with, or as substitutes for, the undistilled fatty acids heretofore used, the necessary degree of whiteness and hardness can be obtained at a diminished expense: the operation of distilling having a very powerful bleaching effect upon them. When palm oil is the material to be operated upon, it is first converted into fatty acids, by the ordinary process of saponification; these acids are distilled, and the product of distillation is granulated and cold pressed; by which means, stearic acid and a light coloured oil are obtained; and the stearic acid, after being washed, is employed for making composite candles, in the same manner as the stearic acid of tallow has been hitherto used, by mixing it with the stearine of cocoa-nut oil, or other suitable unacidified fatty material. If a cheaper article is required, a compound fatty acid is used, consisting of the entire product of the above distillation, mixed with half its weight of distilled and cold pressed stearic acid of tallow. When tallow is the material to be operated upon, it is deprived of its oleine, or a great portion thereof, by pressure or other means (accompanied with artificial cold, if necessary); and the oleine is then cooled down, and repressed or bagged, with artificial cold, to separate a further portion of solid matter therefrom; this being added to the other hard or solid matter, the mixture is converted into fatty acids, and distilled; and the entire product of distillation is employed for making composite candles; or, if a greater degree of hardness is desired, the product of distillation is pressed, which separates it into a harder fatty acid (to be used, in combination with other materials, for making composite candles, or, alone, for making candles) and a light coloured oily acid. In obtaining distilled fatty acids from other fatty or oily matters (not being palm oil or tallow), either the entire substance of those matters is converted into distilled fatty acids, in a similar manner to the palm oil, or the operation commences with the extraction of an unacidified oil; according as it is desired to obtain the liquid matter in the form of a distilled oily acid, or of an undistilled unacidified oil.

As distilled stearic acid is more crystalline than undistilled stearic acid, an addition is made to the mixed materials used for making composite candles of from two to four per cent., by weight, of wax, to assist the amalgamation of the fatty acid with the unacidified fat.

The patentee's claims are as follows: "Firstly,—I claim the using of artificial cold in the processes of treating fatty and oily matters, in order to obtain an eventual separation of the more liquid parts thereof from the more solid parts thereof,—and I claim the using of ice in such processes; and the using therein of an artificially cooled atmosphere,—and I claim the application to the manufacture of candles of products obtained from fatty and oily matters, by treating the same when subjected to artificial cold. Secondly,—I claim the using of an atmosphere of artificial cold in the making of candles, as above described. Thirdly,—I claim the manufacture of fatty acids from the harder parts of fatty or oily matters, when artificial cold has been used in the process of abstracting the liquid part thereof. And I claim the application of fatty acids, so obtained, to the manufacture of candles. Fourthly,—I claim the distillation of fatty and oily acids, obtained from fatty or oily matters, previously treated by pressure or other suitable means, in order to extract the more liquid part thereof; and the application to the manufacture of candles of the product of such distillation. And, Fifthly,—I claim the using of distilled fatty acids in the manufacture of composite candles."—[*Inrolled in the Petty Bag Office, February,* 1845.]

To Robert Ferguson *and* John Clark, *both of the city of Glasgow, in the county of Lanark, for an improvement in printing and calendering.*—[Sealed 14th September, 1844.]

The first part of this invention relates to the cylinders or bowls of calico printing machines, and consists in forming the outer covering or surface of the cylinder in a peculiar manner, whereby the ordinary covering of "lapping" is dispensed with, and the employment of an endless blanket is rendered unnecessary, as the new surface is sufficiently smooth and elastic for obtaining the impression from the printing roller or rollers, whether engraved or cut in relief.

The improved covering or surface is formed in the following manner:—The cylinder, after being well cleaned, is rubbed over with a solution of green senegal (formed by dissolving eight pounds of the gum in one gallon of water), and placed in the printing machine, which is to be furnished with a plain copper roller, in place of the ordinary engraved printing roller; a piece of cotton cloth, coated on one side with India-rubber cement, is now placed with its uncoated side next the cylinder, and with a blanket interposed between it and the copper roller; a slight pressure being then put on the machine, one round of the cloth is rolled upon the cylinder, and is carefully cut from the remainder of the piece, so as to make a neat join. The patentees then take a piece of "Clark's patent India-rubber cloth,"* or a piece of cotton cloth, *mousseline-de-laine*, thin flannel, or fine woollen cloth, coated on one or both sides with India-rubber cement, or "Jeffery's patent marine glue," and, after cutting the end straight, it is laid upon the cylinder; a slight pressure is then put on the machine (the blanket having been removed), and from twenty to thirty rounds of cloth are rolled upon the cylinder: the end of each round is cut correctly opposite the previous end, so as to make a good join. The pressure is increased every five rounds, ending with a pressure similar to that used in printing; and the machine is caused to continue in motion, with this pressure, for half an hour: the attendant keeping the copper roller clean, by rubbing it with a cloth, damped with weak soap-suds, to prevent the India-rubber cement, or marine glue, from adhering to the roller. After this, the outer surface of the cloth is coated with a mixture of India-rubber cement and lamp-black, to the thickness of one-sixteenth of an inch; or the mixture is applied to a piece of "Clark's patent India-rubber cloth," and one round of the cloth is rolled on the cylinder. When the mixture is dry, the elastic surface is cut to the required width, whilst the cylinder is revolving, by means of a chisel upon a rest; and the revolution of the cylinder, in contact with the copper roller, is continued for about an hour. The coating is now "cured," by rubbing over it sulphuric acid, of the usual strength, or muriatic acid, diluted with water to 60° of the Tweeddale hydrometer; this acid is allowed to remain on for about fifteen minutes (the cylinder continuing to revolve), and is then washed off with clean water. When in use, the cylinder is kept clean by a roller, covered with sponge or cloth, in a moist state; and the superfluous moisture left by the roller is taken up by a lint or dry doctor.

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* For description of this cloth see Vol. 23, p. 262, of our present Series.

The following is another mode of producing the elastic surface:—After the cylinder has been rubbed over with a solution of gum senegal, as before mentioned, and has received one round of cotton cloth or other material, coated on the outer side with India-rubber cement, a band or fillet of flannel, or other suitable material (three inches in breadth, and coated on both sides, and at the edges, with India-rubber cement), is rolled tightly round the cylinder, by commencing at one end and using a plain copper roller, which presses against it, until the band reaches the other end of the cylinder. This wrapping is then coated with a mixture of India-rubber cement and lamp-black, and when dry, the elastic surface is cut at the sides, and cured, as before described.

Another method consists in covering the cylinder with a few rounds of lapping, in the ordinary way, and applying thereto a quantity of Jeffery's marine glue, brought to a liquid state by the application of a heat of from 200° to 300° Fahr.: the cylinder is now ready for use.

A smooth elastic surface is also obtained by "putting together from twenty to thirty plies of Clark's patent waterproof cloth, or other laminæ, coated with India-rubber cement, or Jeffery's patent marine glue, in the manner before described," and making an endless strap or belt thereof, which is caused to embrace the cylinder, and a flanged roller above it, and is moved onward by the rotation of the same.

The second part of this invention consists in applying a smooth and elastic surface, in the manner above described, to the tables of block-printing machines.

The third part consists in producing smooth and elastic surfaces, in the same way, upon the cylinders or rollers of letter-press printing machines; also in bringing Jeffery's marine glue to a liquid state, by the aid of heat, and casting it into rollers, to be used in letter-press printing.

The last part of the invention consists in the application of a smooth and elastic surface, by the methods above described, to the rollers of calendering machines.

The patentees claim, Firstly,—the application to cylinders, bowls, or rollers, for printing calicoes, of a smooth and elastic surface, in manner herein described; including the belt or strap travelling round the cylinder. Secondly,—the application of an elastic bed or surface for block printing, as above described. Thirdly,—the application of a smooth and elastic surface to rollers and cylinders, and the casting from Jeffery's marine glue of rollers and cylinders for letter-press printing, as above described. Fourthly,—the application of a smooth and elastic surface to rollers or bowls for calendering, as above described.—[*Inrolled in the Inrolment Office, February,* 1845.]

To Christopher Dunkin Hays, *of Bermondsey, in the county of Surrey, wharfinger, for his invention of certain improvements in propelling vessels.*—[Sealed 3rd July, 1844.]

This invention of improvements in propelling vessels, consists, in the first place, in a novel mode of transferring the motive power of the engine to the propeller, whereby the latter may be driven at different speeds, according to circumstances, and without altering the speed of the engine; and also in an improved mode of constructing certain of the working parts, whereby the friction thereof is considerably reduced. Secondly, in a novel construction of propeller, to be used in connection with the other improvements.

The principal object of this invention is the application or employment of an auxiliary steam power, for propelling sailing vessels in a more economical and advantageous manner than has hitherto been done.

According to the present mode of employing steam-engines as an auxiliary power for assisting in propelling sailing vessels, the engines and propeller are only brought into use occasionally, and under certain circumstances, such as during calms and light winds; but when favorable or strong winds prevail, the propeller and engine are thrown entirely out of use, and become so much dead and useless weight in the ship. Instead of following this plan, the patentee makes use of the auxiliary steam power during the whole of the voyage, and under all circumstances wherein it may be applicable. For this purpose, he employs an engine and propeller of such a power, as will be capable of propelling a vessel unaided by any other power, at a moderate speed of (say) 4 knots per hour, during calms and very light winds; and by the adaptation and employment of certain apparatus, hereafter described, connected to the engine and propeller shaft, the vessel may be propelled 4 knots per hour, or nearly so, beyond the speed that she would go if unaided by the apparatus.—For example: suppose that the engine will, as above stated, propel the vessel at the rate of 4 knots per hour in a dead calm, if a light wind (capable of propelling her 2 knots per hour without other assistance) should arise, then, by the additional power of an engine and propeller, with the apparatus adapted thereto, the vessel, by the combination of the two powers, may be propelled, say about 6 knots per hour; and if the wind should increase so as (unaided) to propel the vessel 4 knots, then, by the additional power of the engine, she will proceed at the rate of about 8 knots per hour, or nearly so, and so on according to the power of the wind. The means employed for effecting this object consists in the employment of differential gearing for communicating the power of the engine to the propeller shaft, whereby the propeller may be driven at an increased speed, according to that which the vessel would be propelled by the wind alone. In order to fully understand this point, it will be necessary to examine what would be the effect of the ordinary auxiliary steam power upon the progress of a ship. Suppose this auxiliary power is calculated to propel the vessel 4 knots per hour, unaided by any other power, and to effect this object the propeller is obliged to make 60 revolutions per minute; if a wind springs up, which, unaided, is also capable of propelling the vessel at the same, or a greater speed, than the engine is calculated for, it follows, that although the propeller may still revolve 60 times per minute, still there is no (or, at any rate, very little) increased speed imparted to the ship, and the propeller is revolving uselessly, as the passage of the ship through the water would of itself drive the propeller at nearly the same speed, if the latter were detached from the engine.

The present method of making the propeller available, under these circumstances, is to drive it at a speed greater than that which the progress of the ship itself would give the propeller in its progress through the water; that is to say, if the speed of the ship, sailing 4 knots per hour, is such as would cause the propeller to revolve 60 times per minute, if detached from the engine, it is clear that it will be necessary for the engine to drive the propeller an additional 60, making 120 revolutions in all, in order to propel the vessel about 8 knots per hour. It will be understood, that the engine is not required to exert any increased power to obtain this increased speed, as the ship's motion drives the propeller one 60, and the engine the other 60 revolutions; the wind, therefore, by means of the motion of the ship through the water, assists in driving the propeller, and the engine gives it an additional impetus. If the vessel is propelled by the wind, at the rate of 6 knots, a further increase, equivalent to an additional 4 knots, must be made in the speed of the propeller before the full benefit is obtained from the power of the engine.

In Plate VIII., fig. 1, represents a longitudinal vertical section, taken through a vessel fitted with the improved auxiliary steam power; and fig. 2, is a plan view of the same. A, A, is the boiler and furnace, and B, B, one of Beale's patent rotary engines; C, is an ordinary propeller, with any convenient number of blades, as may be considered most advisable by the engineer or conductor; *c, c,* is the propeller-shaft, which is supported by, and turns in, bearings *d, d, d.*

On the inner end of this shaft, the differential gearing *e, e,* is affixed, as seen best in the enlarged views, figs. 3, 4, and 5. Another shaft *f,* furnished with a feather *h,* is mounted in bearings, immediately above the inner end of the propeller shaft, and carries toothed wheels *g, g,* of different diameters; which wheels are made to slide easily along the shaft *f,* when it is required to change the speed of the propeller: the feather *h,* of the shaft *f,* passes through the bosses of all the wheels *g,* and of course carries them round with it. The shaft of the engine, seen at *i,* carries, at its end, a clutch *j,* which, when brought into contact with the clutch-box *k,* on the inner end of the shaft *f,* causes the latter, with its wheels *g,* to be carried round, and drive the propeller-shaft.

It will be seen, upon referring to the drawing, that the slowest motion is in gear, as would be the case in calms, or very light winds, when it is the whole power of the engine, rather than the speed of the propeller, that is required; but if a breeze should spring up, then it will be necessary to increase the speed of the propeller. To effect this, the engine must be temporarily detached, by loosening the clutch; the second pair of wheels must then be put in gear, and the first thrown out of gear; then, upon connecting the engine again, the speed of the propeller will be very much increased. If the breeze should freshen still more, the engine must be again detached, and the third pair of wheels put in gear, the others being previously thrown out of gear. As the wheels *g,* all slide freely along the shaft, this object is easily effected by the attendant engineer. A friction-brake *l,* of the ordinary kind, is mounted on the propeller-shaft, for the purpose of preventing it from revolving while the toothed wheels are being put in and out of gear. In place of employing stern-propellers, paddle-wheels may be used in conjunction with the differential gearing with the same effect.

In figs. 6, and 6*, a means is shewn of attaining the differential speeds by the employment of cones, pulleys, or drums, which may, under certain circumstances, be found useful. The speed of the propeller is regulated by moving the band along the cones, pulleys, or drums; one set of which must be mounted on, or connected to, the engine-shaft, and the other on the propeller-shaft, which passes through the stern-post of the vessel, as usual when this description of propeller is employed.

The bearing in the stern-post, for the propeller-shaft, is shewn in longitudinal and transverse section, on an enlarged scale, at figs. 7, and 8; and an end view thereof at fig. 9. As the length of this bearing is greater than that of ordinary bearings, the friction thereof is proposed to be reduced by a number of anti-friction rollers *q, q, q,* which are placed around the shaft, in the manner shewn in the figures. These rollers are all placed round the shaft, and are allowed to revolve, both on their own axes and also round the shaft itself. The bearings are provided with proper packing, as at *m, m,* to prevent the water from entering the vessel, as is well understood. At *n, n,* figs. 4, and 5, is a bearing for resisting the horizontal thrust of the propeller-shaft, when in rapid rotation, and which would otherwise quickly wear away the bearings in which the shaft is mounted. This bearing *n,* is shewn detached, and upon an enlarged scale, at figs. 10, and 11: fig. 10, is a view, looking from above; and fig. 11, a transverse vertical section. The bearing consists of a metal box, which is firmly secured to a stationary framing, in any convenient manner; a pin *o,* is screwed through one side of the bearing, and bears against one end of the shaft *c, c,* as seen in the figures, and can be tightened up, as circumstances may require, by merely turning the screw-head, whereby the shaft is prevented from wearing away the sides of the other bearings. The metal box *n,* is supplied with water, until about one-half of the end of the shaft *c,* is immersed, as shewn in the figure; and then a quantity of oil is poured in, which, being the lighter fluid, always floats at the top. A cock *p,* is placed on one side of the box, exactly opposite the centre of the shaft, for the purpose of ascertaining the exact level of the two liquids. By constructing the bearing in this manner, and keeping it properly supplied with water and oil, the working parts are prevented from getting overheated.

The second part of the invention, viz., improvements in the construction of propellers, is shewn at figs. 12, and 13.

It consists in mounting any convenient number of perfectly straight blades, at an angle round the shaft, in such a manner that the said angle may be varied, according to the speed at which the vessel is required to progress. The angle of the blades is regulated by the ring *b*, which must be firmly connected, either to the propeller-shaft, or to radial arms which carry the propellers. In the figures, a ring *b*, is firmly affixed to the propeller-shaft; and the radial arms *d*, carry the blades *c*, at one end, and at their opposite ends are connected to an additional ring *z*, which may be moved round on its axis, but is retained in any given position by clamping-screws. The arms *d*, are also connected to the ring *b*, and are made to turn round on that point, so that, as the ring *z*, is moved round on its axis, it either screws in or forces out the outer ends of the arms *d*, and by that means alters the angle of the blades.

The patentee claims, Firstly,—the employment of differential gearing of any description, whereby the speed of a propeller, or a propeller-shaft, may be increased or diminished, according to circumstances, without altering the speed of the engine. Secondly,—the adaptation or application of a number of rollers round the propeller-shaft, in the bearing in the stern-post; and also the mode of constructing the end bearing and keeping it cool by means of water and oil, as above shewn and described. And Thirdly,—the improved construction of propeller, shewn in figs. 12, and 13, whereby the angle of the propeller may be varied according to the speed of the vessel.—[*Inrolled in the Petty Bag Office, January,* 1845.]

Specification drawn by Messrs. Newton and Son.

To Alexander Ewing, *of the town of Dumbarton, in the county of Dumbarton, Scotland, glass splitter, for certain improvements in the manufacture of crown-glass.*—[Sealed 15th August, 1844.]

In the ordinary mode of manufacturing crown-glass, the metal is liable to be unequal in substance from rim to rim, or in particular places; to produce greater equality of thickness or substance in the tables of crown-glass, is the object of this invention.

The improvements come into operation when the workman, called the gatherer, has formed the piece of glass or metal on the "hand-pointing or gatherer's marver," and when the piece, so formed, is about to be perforated by the blower behind, or during the operation of perforating, or immediately after it. At this stage of the process, the gatherer is to apply that part of the gathering which is near the tube or pipe to the implement *a*, made of iron or other metal (termed a cutter, and represented at fig. 1, in Plate IX.), bolted to the standard *b*, at the back of the gatherer's marver *c*; and then the piece being turned round, an incision is made by the implement, which displaces the metal from the nose of the pipe into the shoulder of the gathering, insuring strong shoulders: the rim may be thus brought to any consistence; and, after expansion, an equality of substance of the table, generally, will be the result; and, owing to such uniformity, a more effectual standing in the annealing arches can be depended upon. The patentee does not confine himself to the form of the implement *a*; he sometimes employs, instead of it, a circular bar of iron or other metal *d*, fig. 2, attached to the marver; and sometimes he uses the edge of the common marver, fig. 3, for producing the same effect.

At the time of perforation, or before, or immediately after that operation, the glass is carried, as usual, to the "pattison hole," and, a heat being taken, it is marvered on the blower's marver; it is then returned to the pattison hole, and, when sufficiently heated, is taken by the workman to the stake or standard *e*, fig. 4, in order to increase the size of the globe. To the upper part of the standard *e*, a cutter *f*, is secured, by a nut and screw, in such a manner as to admit of its being raised or lowered at pleasure; and this cutter is applied to the nose or neck of the piece, to prevent it from swelling at the nose, and to effect a greater disunion of the piece from the pipe. The piece is then taken to the "bottoming-hole," by the blower, and heated, and blown to the size desired; after which it is taken to the "casher-box;" then to the "nose-hole;" then to the "flashing-furnace;" and lastly to the annealing arch or kiln.

The patentee does not confine himself to the details of the apparatus used, as above described; provided the peculiar character of the invention be retained. He claims, Firstly,—the mode of operating in the manufacture of crown-glass described in respect to fig. 1. Secondly,—the mode of operating in the manufacture of crown-glass described in respect to fig. 4.—[*Inrolled in the Inrolment Office, February,* 1845.]

To THOMAS HANCOCK, *of Goswell-mews, Goswell-road, in the county of Middlesex, waterproof cloth manufacturer, for an improvement or improvements in the preparation or manufacture of caoutchouc in combination with other substances; which preparation or manufacture is suitable for rendering leather, cloth, and other fabrics, waterproof, and to various other purposes, for which caoutchouc is employed.*—[Sealed 21st November, 1843.]

THE object of the first part of this invention is to remove or diminish the clammy adhesiveness of caoutchouc, which the patentee proposes to effect in the following manner:—10 lbs. of caoutchouc are reduced to a rough uniform sheet, by passing between iron rollers; then, as the rolling continues, 20 lbs. of powdered silicate of magnesia (French chalk) are gradually sifted upon the caoutchouc, until the whole is well mixed in; and afterwards the mass is worked into a uniform consistence by means of the apparatus used for making what is called manufactured caoutchouc, described in the specification of a patent obtained by the present patentee, April 18, 1837.

If the mixture is intended for cutting into sheets or other forms, it is pressed in moulds, and cut up in the usual manner; but where large sheets, of a coarse quality, are wanted, it is brought to the required thickness by rolling. If the mixture is to be spread upon cloth, or upon a coating of caoutchouc, previously applied thereto, for the purpose of removing the adhesiveness of the same, the mixture is brought to the consistence of dough or putty, by the application of a small quantity of solvent, and is spread in the same manner, and by a similar spreading machine to that described in the above-mentioned specification. When very thin sheets or films are required, the mixture is spread upon cloth, previously saturated with size, and is afterwards stripped off, in the same way as is set forth, with respect to making sheets of caoutchouc, in the specification of another patent, granted to the present patentee, January 23, 1838. Various designs may be impressed upon the surface of the mixture, by means of engraved plates or rollers; and, if required, a dull matted appearance may be given, by placing woollen cloth, or other suitable fabric (previously sized), upon the coated surface of the cloth, and passing them between rollers: the sized cloth is afterwards to be stripped off. For coarse and cheap articles, a proportion of washed lime, or Fuller's-earth, dried and sifted very fine, may be mixed with the silicate, and the quantity of the latter proportionably reduced. The patentee sometimes produces an article, the exterior of which is not adhesive, and is composed of fine materials; the interior containing either more caoutchouc, or more lime or Fuller's-earth, as the case may require.

All the above-mentioned combinations will be of a light drab color, or of a darker shade, according to the proportion of silicate used; but other colors may be produced, by mixing any suitable pigment with the silicate; and when printed patterns are required, the color is mixed with a thin solution of caoutchouc. Asphalte may be employed, instead of, or combined with, the silicate, if a dark color is no detriment; its combination with caoutchouc may be effected in the dry state, by reducing the asphalte to powder, and treating it in the same manner as described with respect to the silicate; the proportions found to answer are from 6 to 7 lbs. of asphalte to 8 lbs. of caoutchouc; but if the silicate is also used, the quantity of asphalte should be reduced accordingly: plumbago may likewise be introduced into the mixture, when it is of a dark color. This mixture, when intended to be spread upon cloth, or made into thin sheets, is softened and treated in the same way as the mixture first mentioned. Nearly the same results are obtained by dissolving the asphalte in coal naphtha, and employing this solution, instead of naphtha or other solvent, for softening the caoutchouc, to bring it to a suitable consistence for the spreading machine; and if the silicate is to be used with the asphalte, it may be sifted in. These mixtures may be applied in a diluted state, by means of a brush, to waterproofing fabrics.

The second part of this invention, consists in preventing or diminishing the tendency of caoutchouc to stiffen and harden, when exposed to a cold temperature, and to become softened or decomposed by heat, grease, or oil, by intimately blending sulphur with the caoutchouc, and treating the combination in the manner hereafter described.

Various modes of combining sulphur with caoutchouc may be adopted; but the patentee prefers the following:—The caoutchouc, after being rolled into rough sheets, or cut to any convenient form or size, is immersed in melted sulphur, contained in an iron vessel, and kept at from 240° to 250° Fahr.; it is there allowed to remain until the sulphur has completely penetrated the caoutchouc, which may be ascertained by cutting it with a wet knife, and if the operation is complete, the color of the caoutchouc will be changed throughout to a yellowish tint; the sulphur, adhering to the surface, being then scraped off, the caoutchouc will be found to have taken up from one-tenth to one-sixth of its weight of sulphur. Sulphur may likewise be combined with caoutchouc, by reducing the former to a fine powder, and mixing it mechanically; and it may also be blended with the surfaces of articles of caoutchouc, by heating them to about 200°, and sifting and rubbing flour of sulphur upon them. The patentee sometimes blends sulphur with caoutchouc, by means of a solvent; saturating the solvent with as much sulphur as it will take up by boiling, and employing as much of this saturated solvent as will, after evaporation, leave the requisite proportion of sulphur blended with the caoutchouc: when this saturated solution is allowed to cool, any excess of sulphur will fall down in crystals; if, therefore, it is desired to employ a larger proportion of sulphur, it must be kept hot,—in this case, the patentee prefers to use oil of turpentine as the solvent. The silicate of magnesia, and other substances, mentioned in the first part of this description, may, if preferred, be mixed with the combination of sulphur and caoutchouc, in suitable proportions for removing the clammy adhesiveness; but it should be understood that the addition of these substances has the effect of lessening the elasticity of the caoutchouc. These mixtures may be applied to the same purposes as those described under the first part of this invention.

The patentee remarks, that the caoutchouc, although combined with sulphur, as above described, is still as soluble as before, and has not yet undergone the change by which the improvements contemplated in this portion of the invention are carried out, viz., that of resisting the action of the varying temperature of the atmosphere, and also that of various solvents. When caoutchouc alone is to be operated upon, this change may be produced by immersing it in melted sulphur, as hereinbefore mentioned; and then raising the temperature to 300° or from 300° to 370°, and keeping the caoutchouc immersed for a longer or shorter period, according to its bulk or thickness, or the extent to which the change is required to be carried: for instance, if sheet caoutchouc, one-sixteenth of an inch thick, is immersed in sulphur, at 350° to 370°, from ten to fifteen minutes, the change will be produced; or, if the sulphur is heated only to from 310° to 320°, and the caoutchouc immersed from fifty to sixty minutes, the result will be much the same; if continued for two hours, at the same temperature, the effect will be proportionably increased; if continued for a longer time, the caoutchouc becomes of a darker color, and nearly loses its property of stretching; and if carried still further, it turns nearly black, has somewhat the appearance of horn, and may be pared with a knife, similarly to that substance.

This treatment, it is stated, will increase the elastic property of manufactured caoutchouc, and enable it to resist, to a considerable extent, the action of heat, oil, and grease, as well as the effect of cold, and the action of the menstruums by which caoutchouc is commonly dissolved. When the mixture is spread upon cloth, or attached to other substances, capable of enduring the necessary temperature, such articles are passed over plates or cylinders, heated sufficiently to effect the change; and in some cases, such as for the strapping on the seams of garments, hot irons may be employed to effect the change. Another mode of submitting the articles to the necessary temperature is, by means of a stove, heated to the required degree; which degree, and the proper period for the article to remain in the stove, must depend upon the nature of the case: for instance, if sheet caoutchouc, or thread, or any similar article, is to be operated upon, the time and temperature before mentioned, with respect to melted sulphur, will answer; if the article is partly composed of cloth, coated on one side, such as a single texture of calico, rendered waterproof by a thin coat of the mixture, a temperature of from 290° to 300° will be sufficient, and the period for remaining in or passing through the stove, from one and a half to two minutes,—for a thicker coat, longer time will be necessary; when two plies of cloth are to be united, the time and temperature must be regulated according to the thickness of the textures, and the interposed coating of the mixture; when a greater number of plies of cloth are to be combined, and it is imagined, from the thickness of the cloth, or the number of plies, that the heat will not readily penetrate the mass, two folds of the cloth are first united, and passed through the stove, until the change is effected; then, another fold being added, they are again passed through the stove, and so on until the required number of folds are united. Another method of effecting the change is, by immersing the articles in water or steam, under pressure, raised to the desired temperature.

By introducing a small quantity of boiled linseed oil, stearine, or spermaceti, with the sulphur, an agreeable smoothness is communicated to the surface of the mixture. When the mixture is to be used for saturating cloth, or similar purposes, or for coating uneven surfaces, it is diluted with a solvent to any required consistence, and applied with a brush; and the articles are afterwards submitted to the action of heat. The sulphur may, if desired, be more or less discharged from the caoutchouc, after it has undergone the change, by submitting it to the known solvents of sulphur; preference being given to a solution, in water, of sulphate of soda, at a temperature of 200°.

The patentee claims, Firstly,—the combination of caoutchouc with silicate of magnesia; whereby manufactured caoutchouc is rendered free from that clammy and adhesive character which it usually possesses. Secondly,—the modes, herein described, of combining asphalte with caoutchouc. Thirdly,—the treating of caoutchouc (either alone, or in combination with other substances) with sulphur, when acted on by heat, and thus changing the character of caoutchouc, as herein described.—[*Inrolled in the Petty Bag Office, May,* 1844.]

To WILLIAM BROCKEDON, *of Devonshire-street, Queen's-square, in the county of Middlesex, Gent., for improvements in covering the roofs of houses and other buildings, in covering the valves used when propelling by atmospheric pressure, in covering the sleepers of railways, and in covering parts of stringed and keyed musical instruments.* —[Sealed 24th July, 1844.]

THIS invention consists in the application of India-rubber, combined with sulphur, and subjected to a high temperature, as described in the specification of a patent granted to Thomas Hancock, 21st November, 1843,* to various useful purposes. The India-rubber, thus treated, being unaffected by the varying temperature of the atmosphere, it is proposed to be used by the patentee, firstly, for coating the boarding of wooden roofs of buildings; this is effected by rolling the India-rubber into sheets, and securing the sheets on the roof by nails. The second application consists in forming therewith the surfaces of the longitudinal valves which close the slits or openings in the main pipes or tubes of atmospheric railways, instead of using leather as heretofore. Thirdly,—the invention consists in inserting this combination of India-rubber and sulphur between the rails and sleepers, or between the chairs and sleepers of railways: when the rails are fastened upon continuous sleepers, without the intervention of chairs, the composition is cut into long strips, corresponding in width with the base of the rail, and is placed between it and the sleeper; but when chairs are used, the composition is cut into pieces corresponding in area with the base of the chair, and is inserted between the chair and the sleeper. Fourthly,—this composition is to be used as a substitute for felt or leather, for covering the heads of pianoforte hammers (the strips of composition being slightly stretched over the hammer-heads, and secured thereto by a solution of India-rubber, or other suitable means); and also for covering the key-stops of flutes and similar wind instruments.

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* For description of this invention see p. 178 of our present volume.

In using the composition for roofing and railway purposes, it has been found advantageous to combine calamine therewith, in the state of powder (but the patentee does not claim the use of calamine for such purposes); and other matters may also be mixed with the composition, to lessen the expense of preparing a given quantity.

The patentee, in concluding his specification, says: "What I claim is, Firstly,—the combining a preparation of India-rubber, of the character herein described, with the boarding or wood covering of the roofs of houses and other buildings. Secondly,—I claim the adaptation and application of a preparation of India-rubber, of the character herein described, for covering and contact surfaces of the parts of valves of atmospheric railways, as herein described. Thirdly,—I claim the combining of a preparation of India-rubber, of the character herein described, with the upper surfaces of sleepers of railways, so as to produce an elastic bed for the rails or chairs. And Fourthly,—I claim the combining a preparation of India-rubber, of the character herein described, with the hammers of pianofortes, and with the key-stops of flutes and other musical instruments having like stops acted on by keys."—[*Inrolled in the Inrolment Office, January,* 1845.]

To James Boydell, Jun., *of Oak Farm Works, Staffordshire, iron master, for improvements in the manufacture of metals for edge tools*—[Sealed 26th January, 1843.]

This invention consists in welding iron and steel together, in such a manner that, when cut up to form edge tools, the steel will be in a thin layer to form the cutting-edge. The patentee effects this improvement by first piling a slab or plate of steel upon two or more similar plates; then heating it in a furnace to a good welding heat, and passing it between grooved or other suitable rollers, by which means it is converted into bars; the steel being in a thin layer, either on one of the outer surfaces of the bar, or between two surfaces of iron, according to the kind of tool required to be made therefrom. The bars thus produced are cut up, and manufactured into the shape of the desired articles, by forging; they may then be tempered, and the cutting-edges ground as usual. When making plane irons, or other tools in which the steel of the cutting-edge is required to extend but a short distance, the patentee applies the steel only near one edge or side of the pile,—so that when cut up and manufactured, the steel will be only on the cutting part of the blade. In this manner axes, hatchets, adzes, choppers, knives of all kind, scissors, razors, scythes, chisels, gouges, &c., may be economically manufactured; the steel being used merely for forming the edge, whilst the requisite stiffness of the tools will be obtained by the iron combined with the steel.

The bars which have the steel on one side are suitable for chisels and other similar tools, which have a cutting-edge on one side; the iron being ground away when making and sharpening the tool, and the steel cutting-edge being left, as shewn at fig. 1. Those bars having a layer of steel running through them, are intended for forming that class of tools, both sides of which are ground away to make the cutting-edge, as shewn at fig. 2.

Fig. 2.

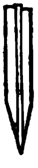
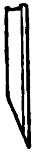


Fig. 1.



The second part of the invention consists in preparing metals for the manufacture of spades. It has hitherto been the practice in making this article, to form iron into "moulds" and "half moulds," each of which were formed by a separate forging; they were then "steeled" for the cutting-edge, and plated out by the hammer or roller. By the present invention, however, several moulds or half moulds are produced in one bar; and, when required, steel is applied between two half moulds, or on the front or back surface of a mould.

In carrying out this part of the invention, a bloom or pile of iron is hammered into a proper shape, and then, by means of a tilt-hammer, a series of recesses are formed therein; thus bringing the mass of iron to the form of fig. 3, (the upper and under surfaces being flat). The indented bar is then passed lengthways between rollers, by which means it is made to assume the form of fig. 4, and is ready to be cut in pieces at the dotted lines *a*, *b*; which pieces form either moulds or half moulds, according to the thickness of the metal. When the metal is only thick enough for half moulds, two such bars as that shewn at fig. 4, are welded together; care being taken to keep the corresponding parts *b*, (which are to form the straps of the spade), from joining, by inserting clay between them. Should it be required to give the spade a steel cutting-edge between the two half moulds, this may be effected by placing over the parts a thin plate of steel, of a width sufficient for one plate to form the cutting-edge of two spades. If the front or back of a spade or shovel is to be steeled, a slab or bar of steel must be placed on one side of each of the moulds, and the whole submitted to a welding heat, when the surface of the metals will run together sufficiently to allow of the bar being removed from the furnace and passed between rollers, which will weld the parts together, excepting where the clay (as before mentioned) is introduced. The bar, thus produced, is then to be cut at the lines *a*, *b*, and the moulds plated out in the usual manner.

Fig. 3.

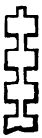
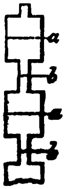


Fig. 4.



The third part of this invention relates to a peculiar manufacture of steel, for making edge tools, whereby a very suitable metal is produced at a small cost, compared with the steel now used; it consists in melting malleable iron in a blast furnace, and making it again into malleable iron, by puddling; or, it may be, refining and puddling such cast-iron, and drawing the same into bars or rods, and converting it into steel. In carrying out this part of his invention, the patentee prefers using scrap or wrought-iron, which is introduced with coke into a cupola, and is run into pigs; the iron is then puddled, and again converted into wrought-iron, in the same manner as if it had been obtained direct from the ore; or the pigs of cast-iron, obtained by melting wrought-iron, may be refined and puddled. The puddled iron is then, by means of hammers or rollers, drawn into bars and converted into steel, in the ordinary manner.

The patentee claims, Firstly,—the mode of manufacturing metals for the class of edge-tools first above described, by piling iron with steel, and rolling such piles into bars; and then cutting up the bars of metal, and manufacturing the parts thereof, by forging them into the shapes of the edge-tools described. Secondly,—the mode, above described, of manufacturing the metals for that class of edge-tools called spades and shovels. Thirdly,—the mode of manufacturing steel for edge-tools, by employing iron which has been melted after having been converted into malleable iron, and again made into malleable iron, as before described.—[*Inrolled in the Inrolment Office, July,* 1843.]

To James Power, *of Threadneedle-street, in the city of London, merchant, for improvements in the manufacture of candles and soap, and in treating a certain vegetable matter for such manufactures and other uses,—being a communication.*—[Sealed 12th September, 1844.]

This invention consists in rendering the products obtained from olive oil available for the manufacturing of candles and soap, and for other uses; also in treating olive oil, and its constituents, margarine, oleine, and stearine, so as to convert such constituents into acids, to separate the concrete fatty acids from the liquid acids, and to purify them separately for their respective uses.

The mode of treating olive oil, according to this invention is as follows:—The oil is put into a vat, lined with lead, and for each 100 lbs. of oil, 14 lbs. of slaked and sifted lime (previously brought to the consistence of cream by the addition of water) are introduced; the mixture is caused to boil, by the admission of steam through perforated pipes at the bottom of the vat, and the boiling is kept up for a period varying from 12 to 20 hours; the vat is then covered, and the contents allowed to settle. The substance which subsides will have a granular appearance, if the boiling has been sufficient to produce the combinations termed margarate, oleate, and stearate of lime; after being removed from the vat, it is dried, crushed, and sifted.

Into another vat, made of white wood, as much sulphuric, nitric, or hydrochloric acid is introduced, as will saturate the lime used in the first process; and whichever acid is used, it should be diluted with seven or eight times its weight of water: sulphuric acid is the most economical; and 18½ lbs. of it will saturate 14 lbs. of lime. The diluted acid is made to boil, by means of steam pipes, and the powdered compound of lime and fatty acids is thrown in; the boiling is continued until the lime combines with the mineral acid, and the fatty acids, becoming thereby disengaged, float on the surface of the water, while the lime falls to the bottom, in the state of sulphate of lime; the steam being now turned off, the contents of the vat are allowed to rest for some time; and then the fatty acids are removed, and washed with water in a leaden vessel. After this washing the fatty acids are put into porcelain, glass, or stone-ware vessels, heated by a steam bath; when they become melted an addition is made for every cwt. of 4 oz. nitric acid of 1·30 specific gravity, together with some small pieces of zinc, and as much water as will dilute the acid to about 3° or 4° Baume, which is from 1·020 to 1·027 specific gravity; and the mixture is stirred with a rod of white wood for five or six minutes, during which time nitrous fumes will be evolved by the action of the zinc upon the nitric acid. The heat is continued for about two hours, with occasional stirring; then the vessels are removed from the steam bath, and their contents washed with water, and allowed to cool in wooden vessels. When cold, the fat is put into bags, and submitted to pressure, in a screw or hydraulic press, until the oleic acid has been expelled. The pressed cakes are melted in a boiler, and 20 per cent. of alcohol (about 48° over-proof) or wood spirit, commonly called wood naphtha, is thoroughly incorporated with the melted fat by agitation; the mixture is then drawn off into a vat, which is to be carefully covered, and the mixture left for about 15 to 20 hours to cool and crystallize. The solid fat acids, thus obtained, being now subjected to pressure, a thin oily-looking liquid will run off with the spirits, and the combination must be afterwards distilled, to recover the spirits for future use. The pressed cakes, which consist of a mixture of margaric and stearic acids, are melted in a shallow leaden vessel, along with a quantity of water, and are kept boiling by means of steam, while the surface is exposed to the air and sunshine (if practicable) for about 15 to 20 hours. The concrete fatty acids are bleached by adding to each cwt. of them, 2 lbs. of sulphuric acid, diluted with 8 lbs. of water, with which 4 oz. of pulverized peroxide of manganese has been previously mixed, and steaming the whole in a vat, by means of a perforated leaden pipe.

Candles may be made from the above products of olive oil, either alone, or combined with wax or other material. In making mould candles, the patentee prefers to use glass moulds, and expose the candles therein to the bright daylight, in order to produce a bleaching effect upon them.

The oleic acid may be used for making soap, in the same manner as oleic acid from tallow and other substances has been before used. It may also be employed, instead of other oils, in the manufacture of wool.

The patentee claims, as his invention, "the manufacture of candles by applying stearic and margaric acid of olive oil; and the treating of olive oil in the manner herein described, for obtaining such acids for the manufacture of candles, soap, and other uses."—[*Inrolled in the Inrolment Office, March,* 1845.]

REPORTS OF AMERICAN PATENTS.

From the "Journal of the Franklin Institute,"

EDITED BY DR. THOMAS P. JONES.

To William K. Allen, *Brownsboro', Oldham County, Kentucky, for an improvement in the plough.* [Dated 31st January.]

This plough is made altogether of iron; the standard is jointed to the land side, and connected with the mould-board by a setting screw bolt. The beam is jointed to the top of the standard; and the back end, which is slotted, is connected with the handles by a setting screw bolt; and then two links are jointed with screw bolts to the lower end of the handles, the standard, and beam.

Claim:—"I make no claim to the individual parts of the plough, nor to making it entirely of iron; but all that I do claim, and for which I ask letters patent, is the adjustable plough stock, in combination with the adjustable handle, as set forth."

To JOHN TAYLOR, *Shade Gap, Huntingdon county, Pa., for a machine for forging and swaging anvils.*—[Dated 31st January.]

THE swages in this machine, as in all others, are made one movable and the other permanent; the latter is called, in the specification, the bed; the two are so formed as to give to the anvil, when completed, the required curves; and to prevent this operation from forcing the surplus metal to the face, and rendering it uneven, there is a vertical rest, which is a continuation of the bed, against which the face of the anvil to be acted upon is placed. After the proper curves have been given to the anvil, it is secured in a double screw clamp, jointed to the floor; and, on each side, there is a common anvil, placed at such a distance from the clamp, that the two sides can be forged, alternately, without removing the anvil from the clamp.

Claim:—"I make no claim to the frame, hammers, and guides. What I claim, is the bed on which the anvil is formed; shaped to correspond with the required form of the anvil, in combination with the vertical face, rest, or guage, as set forth. Likewise, the jointed clamp in combination with the side-rests or anvils."

To JOSEPH WEISMAN, *Philadelphia, Pennsylvania, for a new compound or paint, denominated "the indestructible carbonic paint."*—[Dated 31st January.]

THE patentee says, the nature of my invention consists in combining the metal of carbon, or purified graphite, with caoutchouc and shellac, together with a small portion of acetate, or sugar of lead; the ingredients being mixed with linseed oil and spirits of turpentine.

Claim:—"What I claim as my invention, and desire to secure by letters patent, is, the combination of carbon or pure graphite, with caoutchouc and shellac, together with acetate of lead, linseed oil, and spirits of turpentine, for the purpose set forth, forming a perfectly indestructible anti-corrosive pigment, which also serves the purposes of anti-attrition.

To STEPHEN WATERMAN, *Greenwich, Conn., and* D. RUSSELL, *New York city, for an improvement in ships' blocks.*—[Dated 31st January.]

THIS improvement consists simply in putting the metal strap used on ship blocks, on the inside, instead of the outside, of the cheeks, so that these straps are directly against the sides of the sheave; thus shortening the bearings of the pin, which may, therefore, be reduced in diameter.

Claim:—"What I claim, is constructing the blocks in the manner described, with the straps passing down through the shell, on the inside, close to the sheave, in the manner and for the purpose described."

To MOSES PALMER, *Baltimore, Maryland, for an improved method of lining metal boxes of carriage-wheel hubs.*

THIS is for lining the metal box with leather, by cutting or casting a groove inside of the box, along its whole length, to receive and hold the edges of the leather lining. At one end this groove passes entirely through the thickness of the metal of the box, to secure the leather by means of rivets, or other analogous devices.

Claim:—"What I claim as new, is the combining of a lining of leather, or of hide, with a metallic box, intended to be inserted in the hub, or nave, of a carriage-wheel; such lining being secured in place and combined with the metal substantially in the manner set forth, and made known."

To GEORGE PECK, *Fairfield, Connecticut, for an improvement in the cotton press.*

THIS is for an improvement in a press previously patented, but which has not yet been noticed in this Journal, in consequence of the hiatus in this list, which we hope to close up very soon.

The action of this press is upwards, and to the under part of the follower two rods, called "levers," are jointed, the other ends of which rods are provided with rollers, that run on rails on a horizontal platform. Blocks, or pulleys, are attached to the lower ends of these rods, provided with appropriate cords, or chains, that wind around a windlass midway between the rods, or levers, for the purpose of drawing them towards each other, and thus cause them to act in the manner of a double toggle-joint lever, in forcing up the platten or follower of the press; the platform taking the place of the lower arms of the toggles. Such is the press previously known, and the improvement in question is for the purpose of drawing out the rods, or levers, and drawing down the platten, which is effected by means of two springs on each side, one extending from the lower end of each rod, or lever, passing over the end of an arm jointed to, and projecting from, the side of the frame, and then extending up to the end of another spring, projecting out horizontally from the upper part of the press-frame.

Claim :—" I make no claim to the combined levers and follower, nor to the apparatus for drawing them together in pressing; but what I do claim, as my invention, is the combination of the springs and levers for drawing down the follower, in the manner set forth."

To Samuel Rust, *city of New York, for an improvement in lamps.* —[Dated 9th March.]

This is for an improvement in hand and other lamps, in which the wick is raised by means of a roller, and the object is to insure the raising of the wick by the roller, which it does not always do as heretofore arranged, and to facilitate the introduction of the wick. These two objects are attained by attaching a spring to the wick tube which extends up through a hole, or recess, in the cap, made sufficiently large to give it ample play. The upper end of the spring is provided with a thumb-piece, by which it can be pressed towards, or drawn from, the roller.

Claim :—" What I claim is a thumb-piece, press, or slide, to manage the wick by pressing the thumb-piece, press, or slide, against the wick, or wick raiser, with the finger or thumb, or relieving the pressure from the wick or wick raiser, combined with the roller, or any other wick raiser, analogous to the roller; and also the recess, or opening, in the tube, or stopper, combined with either the spring thumb-piece, press, or slide, as above set forth, or in any other way which is essentially the same."

To Erastus Arnold, *Otsego, Otsego county, New York, for an improvement in the mill for grinding grain.*—[Dated 9th March.]

We have here an improvement in that kind of mills in which the faces of the grinders are vertical, and the nature of this improvement will be fully understood by reference to the following—

Claim :—What I claim as my invention, is the method described of constituting the permanent, or bed, grinder, by covering only a portion of the surface with teeth, and feeding in the grain at the commencement of this grinding surface, and discharging the meal at the other, instead of grinding over the whole surface, as described."

Scientific Adjudication.

LIVERPOOL ASSIZES,—NISI PRIUS.

Before Mr. Justice Wightman.

INFRINGEMENT OF A PATENT,—GOODFELLOW *v.* SWINGLEHURST.

THIS was an action to try the validity of a patent granted to the plaintiff in December, 1838,* for certain improvements in metallic pistons. The declaration stated that the defendant made and used the invention without the license of the plaintiff. The defendant pleaded the general issue; 2dly, that the plaintiff was not the true inventor; 3dly, that the invention was not new; besides three or four other pleas which are usually pleaded in cases of the same nature.

Mr. Baines (with whom was Mr. Webster, author of "Reports on Patent Cases,") appeared for the plaintiff, and stated the case. The plaintiff, Mr. Benjamin Goodfellow, was an engineer and millwright, carrying on business at Hyde, in Cheshire. The defendant, Mr. Thomas Swinglehurst, was a person who, till lately, was a roller maker; but since he had got possession of the plaintiff's invention, he had set up the trade of engine maker, at Preston; and the action was brought for the infringement of a patent, which, some years ago, was obtained by the plaintiff for certain improvements in metallic pistons. In the construction of steam-engines, as the jury were probably aware, an object of first-rate importance was, that the piston should be so adapted to the cylinder in which it worked, that there might be as little escape of steam as possible, because, if the steam escaped, the power was reduced in the same proportion. It would appear that, when the steam-engine was first constructed, the piston was of an extremely rude character in comparison with what it is at the present day. At that time it appeared to have been a mere block of wood, which was fitted into the cylinder in which it was to work, and fitted as tightly as possible; but it was found not to work well, and the next thing was to cover the piston with leather. That plan, however, was found to be objectionable, because, in consequence of heat, the leather lost its pliability, and consequently became ill fitted for the purpose to which it was applied. Then came another improvement; instead of a piston of wood, there was introduced a piston of metal, and that piston had a groove in it, which was filled with hemp; and in consequence of the elasticity of the hemp, the escape of steam was, for a considerable time, prevented; but this hemp became, in course of time, rigid and inelastic, and then all the former evils came over again. At last there was discovered what was called the metallic piston, with a metallic packing; and he (Mr. Baines) would now state what was the improvement introduced by the plaintiff, —an improvement of a very important kind, and in the profits of which he ought to be protected by law. The plaintiff, when he discovered the improvement, was in the employment of Messrs. Ashton, of Hyde, and was an exceedingly industrious and ingenious workman. He had observed the defects of former pistons, and at last hit upon a method for obviating the evils in the use of them. His method was by a metallic packing, the material distinction between which and other inventions was, that, by a combination of three perfect annular springs, between a top and bottom plate of metal, a pressure was obtained upwards and downwards, and also against the sides of the cylinder, so as to constitute a perfectly steam-tight piston. It would be proved that this was a very great improvement upon what had gone before; and so convinced were the plaintiff's employers, in 1838, of the importance of the invention, that they assisted him to obtain a patent. It was obtained; the specification was enrolled in 1839; and the plaintiff had exercised the patent right undisturbed till the defendant thought proper to infringe it. The invention had come into extensive use on railways, and in other places; but, in 1841, a person named Hossack was introduced to the plaintiff. He was at that time a journeyman millright, out of employment, and offered his services to the plaintiff, to obtain orders for the piston. His offer was accepted; and he was furnished, at his own request, with a model of the piston. It so happened, however, that he did not obtain any orders, but entered into the service of the defendant, Mr. Swinglehurst, who, up to that time, had carried on the business of a roller maker, at Preston. After Hossack had entered into his employment, the defendant thought proper to change his trade; and, in 1844, the plaintiff received information that he was making pistons of this kind. The plaintiff went over to Preston, and found that it was so. He was shown one of the pistons made by the defendant, which, though not exactly like the patented invention, was merely a colorable evasion of it, in order, if possible, to prevent proceedings.

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* For specification of this patent see Vol. XV., p. 216., Conjoined Series.

The following witnesses were called in support of the plaintiff's case:—Mr. Benjamin Fothergill, machinist, in the employ of Messrs. Sharp and Co., Manchester; Mr. Peacock, superintendent of the locomotive department of the Manchester and Sheffield Railway; Mr. John Ramsbottom, superintendent of the locomotive department of the Manchester and Birmingham Railway; Mr. William Seed, late of the firm of Messrs. Wilson and Seed, of Preston; and Mr. Bennett Woodcroft, of Manchester.—Mr. Knowles, on the part of the defendant, called the attention of his Lordship to the fact that, in the plaintiff's specification, there was no reference at all to what was claimed as the grand merit of the invention, namely,—that the springs pressed upwards and downwards, as well as laterally. All that was claimed as the plaintiff's invention was the combination of three perfect annular springs, and there was nothing to show that one of the circumstances to be effected by the improvement was the upward and downward as well as the lateral pressure.—His Lordship took a note of the circumstance, and Mr. Knowles then proceeded to say, that there were two questions for the jury to decide; first, whether this was a new invention with reference to the description given of it in the specification, and the object which, according to the specification, it was intended to effect; and if they should suppose it to be new, then would come the question whether that which the defendant had done was in point of fact an infringement. He contended that the merit of the plaintiff's patent consisted very little in what was new; because the jury would find, that almost every point of detail which it presented had already been introduced into some patent or other. The only distinction upon which the witnesses for the plaintiff rested their case was that of the vertical as well as the lateral pressure; an invention which the plaintiff thought of so much importance, that, in his specification, he never once alluded to it; and, without which, it was in evidence that his invention was no improvement at all. The learned counsel then proceeded to argue, that nearly all the details of the plaintiff's invention were to be found in one or other of the inventions of Taylor and Martineau, Hick, and Barton; and that, if there was any novelty in combination in the plaintiff's invention, that of the defendant differed in important respects from it.

In support of the defendant's case, the following witnesses were called:—Mr. John Dewrance, superintendent of the locomotive department of the Liverpool and Manchester Railway; Mr. George Stripe, engineer; Mr. Woods, engineer to the Liverpool and Manchester Railway Company; Mr. Ralph Brown, manager of the Wilmslow Foundry, Edge Hill; and Mr. Hick, engineer, of Bolton.—Mr. Baines replied, and called the attention of the jury to the fact that Hossack, who was the defendant's foreman, had not been called as a witness.—The defendant's son also took a part in the business, and yet neither the son nor Mr. Hossack had they ventured to call before the jury. Why? Because they knew that if those persons had been examined they would have been compelled to say that they had copied this machine from that of the plaintiff. The learned counsel submitted that no invention before that of the plaintiff ever combined the horizontal and vertical pressure, and upon that fact he rested his case.

His Lordship said, that, substantially, there were three questions for the consideration of the jury:—first: whether the invention claimed by the patent was or was not new; and if they were of opinion that it was new, they would also have to say whether it was useful: and, thirdly, if they were of opinion that it was both new and useful, they would have to say whether the defendant had infringed on it; or whether the machine which he had made was different in principle, and substantially varied from that of which the plaintiff claimed the patent right. If there was a substantial difference between the two machines, then the verdict would be for the defendant; but if, on the other hand, they came to the conclusion, that the plaintiff's invention was new and useful, and that the defendant's machine was substantially the same, then the verdict must be for the plaintiff. After a short consultation the jury found for the plaintiff, damages 1*s*., thereby affirming the validity of the patent. Mr. Knowles subsequently consented that it should be also taken as found by the jury, that the specification was sufficient to enable a workman of competent skill to make the machine; and his Lordship reserved all objections to the specification which arose on one or the other issues raised in the pleadings. The Court rose at six o'clock.

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 132, Vol. XXVI.)

Mr. Colthurst exhibited and described, three sections of the embankment across the valley of the Brent, at Hanwell, on the line of the Great Western Railway.

The embankment, which was formed of gravel, was 54 feet in height; it rested on vegetable soil, beneath which was a thickness of 4 feet of alluvial clay; then occurred a bed of gravel, varying from 3 feet to 10 feet in thickness, resting upon the London clay, which was traversed in all directions by slimy beds or joints.

The surface of the country sloped gradually towards the Brent, which was at a level of about 20 feet below the south side of the embankment.

The subsidence of the embankment commenced during the night of the 21st of May, 1837; the next morning, the foundation was discovered to have given way, and a mass of earth, 50 feet in length by 15 feet in width, was forced from beneath the north or lower side of the embankment, towards the Brent. For four months this protruded mass increased in dimensions, and the subsidence of the embankment continued, until the surface assumed an undulating outline, which, on being cut through, showed that the subjacent beds corresponded accurately with the curvatures produced at the surface by the disturbance. The state of the seams or strata beneath the surface, was ascertained by sinking trenches at right angles to the embankment.

The symptoms of failure in the embankment, at this period, were confined to a subsidence of about 15 feet, with a fissure extending all along the top of the south slope, at the side opposite to where the foundation had yielded. From the dip of that fissure, Mr. Colthurst inferred the nature and inclination of a rupture of the ground under the embankment.

Immediately on the commencement of the slip, Mr. Brunel directed a terrace to be formed, on the swollen surface, at the north foot of the embankment; the weight of the mass thus placed, succeeded effectually, in stopping the further progress of the subsidence, which up to that period, had exceeded 30 feet. The swollen ground extended over nearly 400 feet in length, by about 80 feet in width, and was elevated nearly 10 feet, with a horizontal movement of about 15 feet. The general disturbance, ranged to a distance of 220 feet from the foot of the slope, towards the river Brent, the south bank of which, was forced forward about 5 feet.

The rupture of the ground beneath the embankment, was indicated by the crack near the upper part of the south slope.

In a letter received recently from Mr. Bertram, one of the engineers on the Great Western Railway, it was stated, that the Brent embankment had subsided very little for several years; indeed, from the nature of the material, there was naturally less sinking, than in loosely formed clay embankments; a coating of ballast from 6 inches to 9 inches in thickness, applied once a year, was found sufficient for all purposes.

The slips which occurred in embankments formed of clay, occasioned trouble at first, by their immediate effect on the road above, and the difficulty of adding material to them. Mr. Bertram had found in many such instances, in the London clay district, that a temporary measure, of forming the softened mass which had slipped down, into large raised beds or ridges from 8 feet to 12 feet wide, by dressing with the spade, surface punning, &c., had the effect of keeping rain-water out, allowing the raised parts to dry, and retaining the mass in its place, until better weather and matured arrangements, permitted the more permanent proceeding of forming an extended footing and working up the mass with additional material, so as to fill up the space with an increased slope.

When the Acton cutting slipped about 3 years since, Mr. Bertram was induced (from the difficulty of bringing gravel to the spot, and the quantity of surplus stuff in the cutting), to try burnt clay for the drains, for forming an open backing to collect water, and also for mixing with the soft clay in punning up again; from what he then saw, he gave a decided preference to that material, over any kind of gravel, for mixing with clay, to retain it in its place. When gravel was used, there was generally a slight subsidence and opening at the top, but with burnt clay neither occurred. The usual system pursued, was to form with that mixed material, continuous abutments and revetments, upon the original face, and in all cases to make sure of thorough drainage from the back.

He had always been able to trace an immediate connexion between the courses of septaria and the slips at Acton. Those courses were not sufficiently open to act as natural drains: he had made many surface and deep drains leading from them, but the quantity of water drawn off, was not equal to that which was obtained by the means before described.

At Ruscombe, he had removed the gravel stratum from the top, laying bare and well draining the surface of the clay, using the gravel as a footing or buttress below, at such portions of the cutting as had been forced up by previous slips; when there was under drainage from longitudinal culverts, that plan answered very well.

At that portion of the Sonning cutting, which slipped so suddenly two years ago, the stratum of gravel was found to be broken into, by an upraised bank or dam of clay, which, after much wet weather, kept a reservoir of water penned back, until it broke out the mass of clay, down to the next stratum: the dam had been cut across at different points in the slope for the purpose of drainage, and when that was done, all that portion of the cutting became particularly dry. A drain was led from the back of the dam in dressing off the slip. That continued to bring away a great deal of water, which previously had some other outlet, over the lowest point of the bank.

Mr. Sibley thought, the causes of the subsidence of the Hanwell embankment were very obvious. In laying out the foundations of the Lunatic Asylum, in that immediate vicinity, and in the formation of a deep sewer, with a soil pit 20 feet in diameter, and 20 feet in depth, at the side of the Brent, he had ample opportunity for examining the strata, and it appeared to him, that had a trench been made in the direction of, and at the foot of the embankment, the marshy piece of land where it was situated, would have been sufficiently drained, to enable it to carry the weight of the mass laid upon it.

The trustees of the Uxbridge Road had their great store of gravel, in fields to the west of this embankment, and excavations had been going on there for about half a century. The springs in that neighbourhood, accumulated in a reservoir which was formed by an escarpment of clay, skirting the river Brent; part of the waste water, together with the percolation from the reservoir, was permitted to traverse the site of the embankment, rendering the ground marshy even in the driest seasons.

The late Mr. M'Intosh had frequently told him, that a larger quantity of material was used in maintaining, than in constructing, the Hanwell embankment.

In answer to questions from members, Mr. Colthurst explained, that the fissures shown in the clay, beneath the embankment, were assumed from the form of the depressions of the surface. The sections of the ground were taken weekly, during the whole time of the subsidence, so that he contended, the form of the substratum might be assumed as being correct.

The spreading of the lower side of the embankment, displaced the bank of the river Brent for some distance.

Sir Henry Delabèche remarked, that if the sections which were exhibited, approximated to truth, it would appear, that the embankment was formed upon a fault of greater magnitude than usual. The consequences were inevitable; when the fault yielded, the embankment sunk, and continued to subside, until the mass was stopped by weighing the foot, and thus restoring the equilibrium.

Mr. Colthurst said, that the slimy beds, and the fissures, which ran in all directions in the clay, were most difficult to be guarded against, and they were, he believed, the principal causes of slips and subsidences.

Mr. Braithwaite said, that from the observations of Sir Henry Delabèche, it might be inferred, that slips and other movements of earth, were more frequently due to mechanical, than to chemical action, although in the case of the New Cross slip, the latter cause had been much insisted upon.

Mr. John Braithwaite gladly availed himself of the geological knowledge of Sir Henry Delabèche, and his approbation of the measures pursued was highly gratifying to him.

With respect to the Brentwood cutting, although the strata were nearly horizontal, and it might have been imagined, that there would be little tendency to slip, yet from the ground being so full of water, more than ordinary attention to its drainage was required, for it was so retentive of moisture, that a drain had but little influence at a few yards from it.

The draining shafts which were sunk, had operated well, to the extent to which they were carried, and he believed that generally, the mode of treating the Brentwood cutting was considered successful.

He had understood, that the trenches which had been alluded to, had not been extensively used.

Mr. Phipps explained, that the trenches and the wall with dry backing, were tried under his direction merely as an experiment, prior to the examination of the ground by Sir Henry Delabèche. The dry shafts were subsequently sunk, and the only doubt he entertained was, whether there was a sufficient number of them to drain the bank effectually.

Sir Henry Delabèche said, their could not be any doubt of the ground being completely drained, if a sufficient number of shafts were sunk to intercept the water, but then the question of their cost must be considered.

In answer to questions from the President, Mr. Green stated, that his experience did not enable him to lay down any rule for the prevention of slips in cuttings or embankments. They were generally to be attributed to the presence and pressure of water, acting upon the substratum; the method of discharging the water must depend on the direction and nature of the strata; in all ordinary cases, he conceived, that with proper application of the known methods of drainage, successful results might be attained.

He had not made any particular observations, as to the relative duration of the tendency to slip, exhibited by the slopes of embankments and cuttings, in canals and railways; but he conceived, that in a canal, the weight of the water acted as a support to the internal slopes, and tended also to counteract the upward pressure of water in the substrata. He had frequently observed this in cuttings, with embankments on the sides; while the canal was full of water, the banks stood well, but when the water was drawn off, the banks subsided, and the bottom of the canal rose up.

A curious instance occurred in forming part of the Exeter ship canal, through mud lands in the estuary of the Exe. The embankments on the sides of the cutting remained firm, so long as their weight only just balanced the upward tendency of the water in the substratum of the bed of the canal; but when the increased weight of the mass destroyed the equilibrium, the embankments sunk down, and the bottom of the canal was forced up in proportion.

This occurred in several places, even after the works had preserved a perfect section for some months; but the canal had not then been filled with water. It was found, on examination, that at a few feet only below the bottom of the canal, there existed a bed of peat, which, although capable of resisting the weight of the banks for a considerable time, at length gave way; thus the embankments sunk down, the bottom of the canal rose up, and it became necessary to drive strong piles in the line of the bottom of the canal, on each side in a lateral direction, and to support these piles by rough inverted arches of stone, at intervals of about 20 feet, for a considerable distance; after which, the banks, being slowly raised, stood well.

The President said, it must have been observed by all engineers that in the embankments and cuttings of canals, the slips generally occurred within the first six or eight months after the works were completed; but in railway works, the slips constantly occurred even after years had elapsed. He observed on many of the railways on which he habitually travelled, that the slopes were almost as frequently under repair, after being open for many years, as they were within a few months of the first opening. He was decidedly of opinion, that, although water might be the primary cause of the slips, the vibration caused by the passage of the trains, was the more immediate cause.

When, as had been so ably explained, the lower beds became converted into mud, and the adhesion of the particles was destroyed, the mass only required a slight impulsive force, such as the vibration consequent on the passage of an unusually fast or a very heavy train, to set it all in motion and to cause a slip.

Some of the methods proposed for the formation of embankments, such as only constructing them during suitable weather, and with thin layers of material regularly laid and pounded, &c., might be used in the construction of reservoirs for containing water; but they were not compatible with the manner in which extensive works required to be carried on, independent of the extra cost they would occasion. Experience had shewn him that the best method of constructing a heavy embankment, was, to run forward two tips, parallel with each other, forming the outsides of the bank, and leaving a void in the centre which was subsequently filled up. The greatest amount of pressure was thus brought to act vertically upon the material, and the two sides having become somewhat consolidated, were better able to resist the pressure, and they had not any tendency to slip away. This method had been ably treated by Mr. J. B. Hartley, in a paper read before the Institution some years since.

He had not found any difficulty in inducing contractors to adopt that method; when proper precautions were taken to insure thorough drainage, he believed that embankments would, generally, stand well, although made in the wettest weather. Moisture would only cause the mass to become more consolidated; and, when that was once the case, but little water would subsequently percolate.

He concurred in the opinion, that the gravel counterforts acted rather as drains, than as supporting buttresses; for he believed, that they stood, generally, at a steeper angle than the slopes which they were supposed to support.

Mr. Clutterbuck said, in confirmation of the President's opinion, he had been told by the persons who worked in the sand-pits, under the plastic clay, near the London and Birmingham Railway, that they were afraid to remain underground during the passage of the heavy luggage trains, on account of the extreme vibration of the earth.

Mr. Green was convinced of the correctness of the President's opinion, as to the effect of vibration upon banks saturated with water. He had seen instances, even in canal embankments, where, at the head of locks, the vibration arising from the sudden and careless closing of the lock-gates had produced slips.

He did not think any commensurate benefit would result from the extra expense of pounding the earth in embankments, as had been suggested. The degree to which earth might be safely consolidated, by pounding, could only be determined by great attention to the nature of the material, and to the circumstances under which it was used. He had known much injury caused by the earth-backing for walls, being too much pounded, when, from defective drainage, the expansion of the earth had, subsequently thrown the walls down.

Mr. Hughes presented a specimen of Watson's drain pipes. They were made of Staffordshire clay, which possessed great strength and durability; and they had also been made of cast iron. The apertures in the periphery were enlarged, inwards, so as to prevent the possibility of their choking up. The holes were so small, that but little earth could be carried in with the water; but, if any did enter, it fell through into the body of the pipe, and was washed out by the water. The drain tile also having the same kind of apertures.

These pipes had been successfully used, for some time, in the cuttings of the London and Birmingham and the Croydon railways; and Mr. Hughes promised to give, during the next session, a report of the method of using them, and of the result of their application in several wet cuttings.

April 16, 1844.

WILLIAM CUBITT, V. P., in the Chair.

"Account of the Railway from Amsterdam to Rotterdam, and of the principal works upon it." By the Chevalier Frederick Willem Conrad, M. Inst. C. E.; translated from the French, by Charles Manby, Assoc. Inst. C. E. Secretary.

THIS railway, the first that has been constructed in Holland, is due to the enterprise of a public company, called "The Railway Company of Holland," whose affairs are managed by a council of administration, consisting of five commissaries and the engineer. The difficulties of construction, arising from the peculiar physical character of the locality, were amongst the least that the company had to contend against; the directors were, however, satisfied that the utility of the undertaking would be finally understood in the country, and that by perseverance every obstacle would be overcome.

The company was formed on the 8th of August, 1837, at Amsterdam; and, within a short period, the statutes received the royal sanction; but, no sooner had the contract been made for the execution of the first division, from Amsterdam to Haarlem, than numerous law-suits arose, owing to the hostility of the proprietors of the land over which it was intended the railway should pass,—the consequent difficulty of expropriation,—and serious discussions with the engineer, to whom, at that period, the execution of the line was entrusted, and which terminated in his resignation, caused great delays, which were prejudicial to the undertaking.

At length, the government, at the request of the council of administration, appointed the author of this paper 'Engineer director,' and he entered on his duties in March, 1839. After a minute inspection of the line, he found it necessary to complete the first division between Amsterdam and Haarlem, according to the designs of the former engineer; but to adopt different and more eligible plans for all the other divisions. This first part was opened on the 20th September, 1839; and the dispatch that had been used, enabled the council to announce, at the general meeting held in April, 1840, their intention to continue the execution of the remainder of the line, without delay.* The assent of the government being granted, the greater part of the

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* The divisions of the line are—

		Metres.		English.
1°	From Amsterdam to Haarlem .	16817·40	=	18381·4
2°	,, Haarlem to Leyden . .	28270·30	=	30891·1
3°	,, Leyden to the Hague .	15303·80	=	16726·2
4°	,, the Hague to Rotterdam .	24000	=	26232·0
	Total . .	84391·50	—	92230·7

or about 52½ English miles; with fifty-eight bridges in the three first divisions.

year 1840 was occupied in gaining the concurrence of the regencies of the different towns and the 'polders'* through which the railway would pass, and in effecting the expropriations.

In the beginning of the year 1841, the first contract for works was made, including the bridge over the river Spaarne, at Haarlem. This bridge, which is of iron, has six openings; the piers are of brick-work, faced with cut stone. The two middle openings have an iron swing bridge, of a very simple and solid construction, which opens and shuts both openings at the same time, to render the passage of vessels as rapid as possible; as between fourteen and fifteen thousand pass through annually. The principal beams of this swing bridge are each upwards of 23 metres long (= 75 feet 6 inches), and were cast in a single piece: the whole bridge weighs upwards of 110 tons; and the machinery for moving it is so perfect, that one man turns it easily in two minutes. There is also a method of holding the bridge firmly shut during the passage of the train, at which times alone it is closed, and a self-acting signal is attached to it. During the construction of this bridge, the channel of the river was diverted, that the navigation might not be interrupted, and the whole was completed in one season.

There are also five fixed bridges, of the same style of architecture, over the canals within the town of Haarlem, the station at which place is neat and simple.

After much difficulty in obtaining possession of the land for the railway, a contract for the cuttings and embankments, at a given price per cubic metre, was made, to be executed as fast as each individual portion should be obtained, either by private purchase or otherwise; by this means, much time was saved, and the line was completed to Hellegom, during the season of 1841.

At Vogelenzang, near Bennebroek, the canal of Leyden, and the high road, are both crossed by a trellis bridge of 54 metres in length (= 177 feet,) at an angle of 30° with the canal. This bridge is built entirely of red deal, excepting the roadway beams, which are of oak, and is formed by three series of planks, crossing each other in the form of trellis-work; there are three openings, of which, those on either side are each 98·5 metres (=32 feet 4 inches) span; and the centre one is 34 metres (= 111 feet 6 inches) span; the trains pass without causing any vibration.

The next step was, to make a contract for the trussed timber bridge, to cross the towing path, at an angle of 60°, near Leyden; for which the span was required to be 17·20 metres (= 56 feet 5 inches).

Near this spot is the 'Warmonder Leede,' one of the navigable canals, which, at the same time, act as drains for conveying water from the interior of the country, into and out of the lake of Haarlem, by the dykes of Katwyk, as well as serving for commercial and agricultural purposes. The Regency of Rhynland insisted, that the bridge to cross this canal should have five openings, each of 6·30 metres (= 20 feet 10 inches), of which the centre one should have a swing bridge for the facility of the navigation of the canal.

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* The "polders" are the spots of land which have been drained and are now cultivated: their level is usually below that of the sea.

This is of a novel construction, on the system of a sliding bridge; it is built of timber, and the platform is easily moved by one man.

The nature of the soil from the 'Warmonder Leede' to the town of Leyden, was such as to render it necessary to form the railway on fascines or faggots. This plan was also necessary on all the first part of the line; and even at the Leyden station, the whole of the buildings were erected upon a similar foundation, which appears to answer very well.

Beyond Leyden, the railway crosses the Rhine at an angle of 82°, by a trussed timber bridge with five openings; the three centre ones have each a span of 10 metres (= 32 feet 10 inches), and the two side ones are each 6 metres (19 feet 8 inches) span. One of these latter is for the navigation of the river, and is furnished with sliding platforms opening both ways; they are easily managed by one man.

It was not until the end of the year 1841, that the company obtained possession of part of the line of railway at Sloterdyk, in the first division, after a law-suit of four years' duration, relative to the expropriation; and, after being obliged to pay a large sum to the proprietor, for the permission to pass, temporarily, during the law-suit; without which, the first division between Amsterdam and Haarlem could not have been opened.

These difficulties were encountered throughout the whole line, to such an extent, that, at a short distance from Leyden, the obstinacy of a single landowner entirely stopped the progress of the works, and obliged the company to build a temporary station for that town; without this step, the opening of that part of the line would have been retarded for three or four years, there being no legal means of accelerating the process of expropriation. The line was then opened from Haarlem to the immediate neighbourhood of Leyden.

In the course of the year 1842, the whole of the second division, and great part of the third, were completed. Several aqueducts, five large bridges, and a number of small ones, were built; the latter, being all over navigable canals, were made to swing on simple brackets; the permanent station at Haarlem was completed; the foundations were laid of those at Leyden and Amsterdam; and the workshops for the repairs of the engines, &c., were finished.

These circumstances are only mentioned to shew, that, considering the delays occasioned by the defective jurisprudence in the matter of expropriation, more than common diligence had been used to enable the line to be thus far opened.

After the opening of the second division, several of Stephenson's new patent locomotive engines were added to the stock of the company; and, after ample trial of their qualities, they were considered to be the best engines in the service.

A part of the third division was opened as far as Voorschoten, in the month of May, 1843, and thus, with the aid of omnibuses and diligences, the line was completed as far as the Hague, although, owing to the legal difficulties already named, the swing bridge to cross the Hague and Delft canal could not be constructed, nor the permanent station at the Hague be built. These latter works have only been completed in this present year (1844).

Such were the difficulties, the Company had to contend with, from the delay caused by the defective state of the law of expropriation, and the rapacity and prejudice of the proprietors, over whose land the line had to pass, that it was only on the 6th December, 1843, that the railway was completely opened for public use, all the works, as well as the different stations being completed, and a simple and effective system of management established.

The opening of the railway took place, with much ceremony, on the day above named, being the anniversary of the birth of the King, in the presence of his excellency the Minister of the Interior, who was conveyed by it from the Hague to Amsterdam, where, on the same day, he was present at the opening of the Rhenish Railway, from Amsterdam to Utrecht.

The stock of the company now consists of thirteen locomotive engines, with their tenders complete, and one hundred and three carriages of three different classes, which number will be considerably increased.

From the opening of the different divisions, up to the 1st December, 1843, the locomotive engines have traversed a distance of 386,124 kilometres (= 239,786 English miles), and 1,513,935 passengers have been conveyed.

In consequence of the difficulties experienced through the defective law of expropriation, a petition for its revision was presented to the States General, and, from its favorable reception, it is presumed that such a law will be passed, as will facilitate the formation of railways throughout the kingdom, and will cause the speedy extension of the present one as far as Rotterdam, thus uniting two cities so long celebrated in the annals of commercial enterprise.

The rails used in the permanent way are of a bridge form, weighing 30 kilogrammes per metre (= 60 lbs. per yard); they are fixed by screws, upon longitudinal timber bearings, of Riga red deal, with sleepers of the same timber, halved into them, and secured by oak wedges. The ends of the rails are fastened by nuts and screws, through the longitudinal bearings, with joint plates and cramps. This method of fastening is stated to be very complete, and the motion of the carriage over the joints is without shock. The guage is 2 metres (= 6 feet 6 inches English) from centre to centre of the rails; and the cost of each kilometre (= 0·616 of an English mile) of single line of railway laid, is 17,700 florins (= £1475, or £2394. 10*s*. per mile).

The general width of the top of the earth-work for the rails is 9 metres (= 29 feet 6 inches English). The inclination of the slopes of the embankment is twice its vertical height. The side benches vary in width between 1 metre and 2 metres (= 3 feet 3 inches and 6 feet 6 inches English). The ditches are 4 metres (= 13 feet 1 inch English) in width, and the ballasting is composed of sea-shells.

In marshy spots all the earth-works are laid upon beds of fascines, more or less extensive, according to the nature of the ground. In those situations where the railway traverses pools of water, the fascines alternate with beds of rubble, and are held together by stakes and wattles, until the weight of the earth is laid upon them and the mass is consolidated. The earth-work is chiefly composed of sand from the sea beach, and is covered with turf.

The station at the Amsterdam terminus, is a semi-circular building of brick and cut stone, with projecting wings and sheds on iron columns, founded on piles in the usual Dutch manner.

The station at the Haarlem terminus is also of brick and stone, but is not founded on piles, as the ground was sufficiently solid to bear a building.

The Leyden station, which is of the same construction as the others, stands on such bad ground, that it was necessary to construct a raft, placed upon oak piles, to receive the foundation of the building.

The station of the Hague resembles the others, but being constructed on good ground, piles were not necessary.

The bridge over the Spaarne at Haarlem consists of six arches of 8 metres (= 26 feet three inches English) span each; four of them are fixed, and the other two are occupied by a cast-iron swing-bridge, which generally remains open for the convenience of the navigation, and is only closed at the times of the passage of the trains. The machinery for turning this bridge, and for simultaneously opening or shutting both arches, is situated on the centre pier, which is constructed, like the others, of brick and cut stone, upon piles of pine. A self-acting signal is attached to this, and to all the other swing bridges, in order to show their position.

The bridge-keepers reside in two small wooden lodges, built in the river, opposite to each end of the centre pier. The bridge being equally balanced upon the pivot, the labour of working it is small, as compared with that required for working a half-arch swivel-bridge; and it possesses the far more important advantage of perfect stability and freedom from vibration, when once fixed between its bearings—an indispensable condition for a railway bridge.

The foundation piles of the piers are from 8 inches to 11 inches square, and 26 feet 3 inches long. On these piles are laid the longitudinal beams of a timber apron, which traverses the whole of the openings, and extends above and below the bridge, to the extremities of the cut-waters, and on these are placed the transverse bearers of the piers. The whole of the foundation is of white deal.

The following are the principal dimensions:—

	Ft.	In.	
Thickness of the centre pier	21	10	English.
„ piers nearest to the centre on each side	7	4	„
„ piers nearest to the abutments	6	6	„
Length of the iron swivel-bridge	77	6	„
Width of ditto	20	10	„
Length of the middle girder	77	6	„
„ intermediate pair	76	6	„
„ outside pair	74	9	„
Depth of the girders at the centre	4	0	„
„ at the ends	1	0	„
Thickness of the three middle girders	0	2⅜	„
„ outside pair	0	1½	„
„ oak planking of the platform	0	3	„

The castings were made at the foundry of Messrs. Dixon & Co., at Amsterdam.

The cost of the bridge was 83,000 florins (= £6,916. 13*s*. 4*d*.) All the details of dimensions and cost are given.

The timber bridge at Vogelenzang is built on the American trellis-work system; it is 54 metres (=177 feet 2 inches English) long by 9·92 metres (= 32 feet 6 inches English wide), and spans the high road and the canal, with its towing-path, at an angle of 30° with the latter. The piers are of masonry upon piles.

The timber-work consists of three ribs of lattice-work, one on each outer side of the platform and one in the centre, between the two lines of rails. Each series consists of battens of red Riga deal, 3 inches thick and 12 inches wide, crossed at an angle of 45° with the horizon, and therefore at right angles with each other, as shown in the elevation, and well fastened at each crossing, with oak trenails. More than one-third of the depth of the lattices is below the platform; and its general stability is very much increased, and lateral vibration is prevented, by the diagonal trussing shown in the transverse section and plan of the platform. The transverse oak bearers, 10 inches square, on which the planking of the platform is laid, are placed at intervals of about 3 feet, every alternate one being trussed, as shown in the section, and the truss bound together by a pair of iron screw-bolts, 4 feet long, placed between the longitudinal bearers of the rails. The planking of the platform is of white deal, 3 inches thick and 20 inches wide; and, excepting this and the oak bearers of the platform, the whole of the timber-work is of red Riga deal.

The following are the principal dimensions of the parts:—

	Feet	In.	
Length of the bridge	177	0	English.
Total width of ditto	32	6	„
Width of side openings	29	0	„
„ middle opening	111	6	„
Height of the platform	15	9	„
„ lattice above ditto	7	10	„
Depth of the lattice below ditto	5	2	„
Total height of the lattice ribs	13	0	„
Clear width of each roadway ..	13	0	„

This construction is stated to be very satisfactory, and to have cost only 46,000 florins (= £3833. 6*s*. 8*d*.)

The trussed timber bridge, over the Warmonder Leede, crosses the river at an angle of 50°. It has five openings of 6·30 metres (= 20 feet 8 inches English) each; through one of these, the navigation is carried on, and it is closed when the trains pass, by a sliding platform moving diagonally upon rollers, which is worked by one man, and by very simple mechanism, like that of the double platform bridge at Vink.

The heads of the piles for this bridge require to be cut off, and a tenon to be worked upon each, below the water line; this was done by a simple apparatus, consisting of a deal box, well put together and caulked, so as to be water tight; it was two metres (= 6 feet 6 inches English) long, 1·30 metre (= 4 feet 3 inches English) wide, and 1 metre (= 3 feet 3 inches English) deep. Through the centre of the bottom there was a hole, large enough to admit the head of a pile. Around this hole was nailed the open bottom of a sack of stout canvas, strengthened with leather. Two cords were made fast, by one end of each, to the box, and the others were passed through pulleys in the sides.

When a pile was required to be cut off, the box was put over it, and by weights within, it was caused to descend as low as was requisite; by means of the two cords, the lower end of the sack was then drawn round the pile, so as to form a water-tight joint; by a small pump, the water was then emptied from the box, into which a workman descended, turned back the canvas sack, and after sawing off the pile, cut the head into any desired form.

This system is stated to have been used, wherever the piles were required to be cut off under water, and to have been very successful.

The cost of the bridge over the Warmonder Leede was 44,600 florins (= £3716. 13*s*. 4*d*.)

The trussed timber bridge, which crosses the canal and the towing path near Leyden, at an angle of 60°, is fixed, and has a span of 17·20 metres (= 56 feet 5 inches English). Its cost, with some accessory works, was 34,800 florins (= £2900).

The trussed timber bridge over the Rhine, near Vink, beyond Leyden, is at an angle of 82° with the stream; it has five arches, three of which have openings of 10 metres (= 32 feet 10 inches English) each, and the two side arches are six metres (= 19 feet 8 inches English) each; one of these latter, which is intended for the navigation, is closed by two parallel platforms, which slide diagonally in opposite directions; when opening, they are moved simultaneously by one man, with very simple machinery. The cost of this bridge was 41,200 florins (= £3433. 6*s*. 8*d*.)

The single swivel bridge over the Delft canal at the Hague, is of cast iron, and spans the canal at the angle of 72°, with only one opening of 8 metres (= 26 feet 3 inches English). The piers are of masonry, founded on piles. Its cost was 31,000 florins (£2583).

The railway necessarily passes over numerous canals, whose traffic must be provided for; it was consequently requisite to provide a cheap and simple mode of crossing them; the author therefore devised a peculiar form of bridge, and has called it the "turn rail bridge."

Four timber bearers, 12 inches deep by six inches wide, carry the two lines of rails; they are jointed on to heel posts of oak, shod with iron, which turn upon centres, on plates set in the masonry of the abutment. The bearers are further supported by brackets of cast iron; and each pair is connected by two bars, turning on joints, to preserve the parallelism of the rails. Each pair opens outwards, for the passage of the boats; and when they are closed, the ends of the bearers rest in recesses, prepared in the masonry for their reception, in order that the ends of the movable rails shall coincide with those of the fixed ones. This form of bridge is very cheap, and is found to answer well for a span not exceeding 16 feet.

The population of the towns through which the railway passes, is stated thus:

Amsterdam	211,349	inhabitants
Haarlem	24,012	,,
Leyden	37,464	,,
The Hague	63,556	,,
Delft	17,037	,,
Scheidam	12,051	,,
Rotterdam	78,098	,,
Total	443,567	,,

A tabular statement is given of the number of travellers, and the amount of the receipts since the opening of the railway.

Years.	Travellers.	Receipts.					
		Florins	Cts.	£	s.	d.	
1839	77,763	41,765	19 =	3,480	8	7¾	1st division opened Sept. 20, 1839.
1840	349,994	168,833	30 =	14,069	8	10	1st division alone worked
1841	292,556	136,698	61 =	11,399	17	8	Ditto ditto
1842	364,081	210,574	34 =	16,714	10	6¾	2nd division opened to Veenenberg June 20, & to Leyden Aug. 17.
1843	466,498	335,898	90 =	27,991	10	6	3rd division opened to Voorschoten May 1, and to the Hague Dec 7.
	1,550,892	893,770	34 =	73,655	16	2½	

There is also a statement of the number of locomotives employed, their power, sizes, and number of wheels, the makers' names, the number of miles run over, with many other particulars.

A detailed statement is also given of the lengths and height, above the datum line (AP)* of every portion of the three divisions of the railway which are opened, with particulars of all the bridges and other constructions.

This communication is illustrated by a section and plan of the line of railway; a map of part of Holland; and one of the city of Amsterdam; also, a series of lithographic drawings of the bridges and other works on the line; and a model of the turn-rail bridges, to be seen in the society's library.

In a letter to the Secretary Inst. C. E., dated May 4, 1844, Mr. Conrad says: "At the last meeting of the shareholders, on the 26th April, we were authorized to borrow 2,500,000 florins (= £211,750) for finishing the fourth division of the railway, or that part between the Hague and Rotterdam. I shall therefore commence immediately the execution of the works, the plans for which I have already laid down. We expect that a new law of expropriation will be passed, and when the States General have conferred upon us that benefit, we shall see the works carried on with increased vigour.

"Since the opening of the railway, as far as the Hague, the improvement in the value of the shares has been very great; the price in December, 1843, was 56 florins, and is now from 98 florins to 99 florins; and the shares will speedily be at a premium.

"The comparison of the number of travellers and of the amount of receipts in similar months of 1843 and 1844, is curious.

	1843.		1844.	
	Travellers.	Florins.	Travellers.	Florins.
January	17,439	12,929	35,213	30,968
February ..	18,912	14,276	34,203	29,345
March	21,965	16,589	39,498	36,040
April	27,329	20,503	51,698	47,651

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* AP. (Amsterdam Pile), a fixed water level adopted by the Government as a datum line in all the hydraulic works in Holland.

"The tariff of fares is also altered to the following rate:—

d.
First class .. 5 cents per kilometre per passenger = 1·66 per mile.
Second „ .. 4 „ „ = 1·33 „
Third „ .. 2½ „ „ = 0·83 „

This alteration has been found very profitable, as a greater number of passengers now travel in the first-class carriages."

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1845.

Feb. 26. *John Whiteley*, of New Bank, in Northowram, in the parish of Halifax, and county of York, for improved apparatus for feeding fires with coal, and for burning smoke.

27. *Richard Porteous*, of 8, Dartmouth-street, Westminster, for a wind instrument for signals.

Mar. 1. *Thomas Harris Lewis*, of Preston, Lancashire, for a turnip and potatoe cutting machine.

4. *Samuel & Thomas Carrington*, of Stockport, for a hat ventilator.

5. *Thomas Dray*, of Chiswell-street, Finsbury, for a fruit gatherer.

6. *A. Guhraner*, of Birmingham, for a daily indicator.

6. *Le Capelain & West*, of 18, Wimbourne-street, Hoxton, for a cake.

7. *George Smith*, of Hastings, for a window shutter.

7. *Ann Alford*, of Newington Butts, Surrey, for a four-wheeled carriage.

10. *W. Grounsell*, of Louth, Lincolnshire, for an improved dressing machine.

11. *H. D. & J. Nicoll*, of 114, Regent-street, for a coat.

11. *Noel Jeffery Dixon*, of Billacombe, Plymstock, Devonshire, for a galvanic hat.

13. *A Guhraner*, of Birmingham, for a daily indicator.

14. *Samuel Rodgett*, of Blackburn, for a frog-piece for throwing a loom out of gear.

17. *Thomas Harwood*, of Birmingham, for a butter knife.

18. *John Storer Flaxman & Thomas Showell*, of 40, Ludgate-street, City of London, for the "tailor's symmetrometer."

Mar. 19. *Joseph Fenn*, of Newgate-street, London, for an improved coach wrench.

19. *Rippon & Burton*, of Oxford-street, for the vesta or other spirit lamp chimney.

20. *George Lamb*, of Horsley-fields, Wolverhampton, for a spindle for door locks.

20. *Robert Walter Winfield*, of Cambridge-street Works, Birmingham, for the lucent gas burner.

22. *Welch & Margetson*, of 134, Cheapside, for a garter fastening.

22. *John Perring*, of 85, Strand, for an adjusting galvanic band.

22. *John Rockford & Son*, of 35, Dublin City Quay, Dublin, for a window guard.

26. *Henry Vickerman*, of Howden, in the county of York, for a spirit lamp.

26. *Isaac Suggitt*, of Howden, in the county of York, for a lamp for burning spirit.

26. *Richard Wallis*, of Peterborough, for a moulded rush-light.

26. *Collin & Brown*, of Skinner-street, London, for the Victoria glove fastener.

27. *Bradley & Johnstone*, of Sheffield, for a design for mounting the fore parts of carriages.

28. *S. E. Stapleton*, of Mile-end Road, tin-plate worker, for an improved chimney-cap or wind-guard.

List of Patents

That have passed the Great Seal of IRELAND, to the 5th of March, 1845, inclusive.

To William Betts, of Smithfield-bars, in the city of London, distiller, and Alexander Southwood Stocker, of the same place, Gent., for improvements in bottles, jars, pots, and other similar vessels, and in the mode of manufacturing and of covering the same.—Sealed 19th February.

Christopher Dunkin Hays, of Bermondsey, in the county of Surrey, master mariner, for certain improvements in machinery or apparatus for propelling vessels.—Sealed 1st March.

John George Bodmer, of Manchester, in the county of Lancaster, engineer, for certain improvements in locomotive steam-engines and carriages, to be used upon railways; in marine engines, and vessels, and apparatus for propelling the same; and also in stationary engines, and in apparatus to be connected therewith.—Sealed 3rd March.

Benjamin Baillie, of King-street, in the county of Middlesex, glazier and metal-frame maker, for improvements in regulating the ventilation of buildings.—Sealed 5th March.

James Smith, late of Deanston, now of Queen's-square, London, civil engineer, and William Gairdner Jolly, formerly residing at Endrick Bank, parish of Drymon, and county of Stirling, Scotland, now residing at Carter, in the parish of Kilmarnock, and county of Dumbarton, for certain improvements in the form of tiles for draining, in implements for manufacturing them, and in the mode of manufacture.—Sealed 5th March.

List of Patents

Granted for SCOTLAND, subsequent to February 22nd, 1845.

To James Power, of Threadneedle-street, in the city of London, merchant, for improvements in the manufacture of candles and soap, and in treating a certain vegetable matter for such manufacture, and for other uses,—being a foreign communication.—Sealed 24th February.

Robert Oxland, of Plymouth, in the county of Devon, chemist, for improvements in the manufacture of chlorine.—Sealed 24th February.

Jean Albert Palmaert, of Brussels, in the kingdom of Belgium, Colonel of Staff, for improvements in the means of economising and applying heat, obtained from known processes,—being a foreign communication.—Sealed 25th February.

Richard Haworth, of Bury, in the county of Lancaster, engineer, for certain improvements in steam engines.—Sealed 26th February.

William Hannis Taylor, of Piccadilly, in the county of Middlesex, gentleman, and Thomas Bartlett Simpson, of Great Russell-street, in the same county, gentleman, for certain improvements in propelling.—Sealed 26th February.

William Kenworthy, of Blackburn, in the county of Lancaster, manufacturer, for certain improvements in looms for weaving. —Sealed 28th February.

Augustus William Gadesden, of Woburn-square, in the county of Middlesex, gentleman, for improvements in the manufacture of sugar.—Sealed 4th March.

John Blyth and Alfred Blyth, of the parish of St. Anne, in the county of Middlesex, engineers, and George Parker Hubbuck, of Ponder's End, in the said county of Middlesex, engineer, for certain improvements in steam engines, steam boilers, and machinery for propelling vessels, which improvements in steam engines and steam boilers are for the most part applicable to the purposes of steam navigation, but are also applicable to other purposes for which steam engines or steam boilers are or may be used.—Sealed 6th March.

Robert Ferguson, of Dundee, in the county of Forfar, Scotland, linen manufacturer, for improvements in the machinery and apparatus for the manufacture of cloth by hand, steam, or other power.—Sealed 13th March.

Louis Antoine Ritterbandt, of Gerard-street, Soho, in the county of Middlesex, doctor of medicine, for certain improvements in preventing and removing incrustation in steam boilers and steam generators.—Sealed 18th March.

John Fisher, the younger, of Radford Works, in the parish of Radford, in the county of Nottingham, gentleman, and James Gibbons, of New Radford, in the said parish of Radford, machinist, for certain improvements in the manufacture of figured or ornamented lace, or net and other fabrics.—Sealed 19th March.

Alexander M'Dougall, of Daisy Bank, in the parish of Manchester, in the county of Lancaster, gentleman, for certain improvements in the method of working atmospheric railways; which improvements are also applicable to canals and rivers.— Sealed 19th March.

Octavius Henry Smith, of Wimbledon, in the county of Surrey, Esq., for certain improvements in steam engines, boilers, and condensers.—Sealed 20th March.

Wilton George Turner, of Gateshead, in the county of Durham, doctor of philosophy, for improvements in the manufacture of caustic alkalis, soda, and potash, and their carbonates, and also in the manufacture of the ferrocyanates of soda or potash.— Sealed 20th March.

New Patents

SEALED IN ENGLAND.

1845.

To William Smith, of Snow Hill, for improvements in gas-meters and in gas-meter cases,—being a communication. Sealed 3rd March—6 months for inrolment.

George Miller Clarke, of Albany-street, Regent's-park, for improvements in the construction of lamps, and apparatus to be used therewith,—being a communication. Sealed 3rd March —6 months for inrolment.

Thomas Schofield Whitworth, of Salford, Lancashire, for certain improvements in machinery for preparing, spinning, and doubling cotton, wool, flax, silk, and similar fibrous materials. Sealed 3rd March—6 months for inrolment.

John Tomes, of Mortimer-street, for improvements in making artificial teeth, gums, and palates. Sealed 3rd March—6 months for inrolment.

Henry Fox Talbot, of Lacock Abbey, Wilts, for improvements in obtaining motive power, and in the application of motive power to railways. Sealed 3rd March—6 months for inrolment.

William Palmer, of Clerkenwell, for improvements in pressing tallow and other matters and substances, and fabrics. Sealed 3rd March—6 months for inrolment.

Samuel Knight, of Spotland, near Rochdale, for certain improvements in machinery or apparatus for scouring, washing, cleansing, and other similar purposes. Sealed 3rd March—6 months for inrolment.

George Ellins, of Droitwich, for certain improvements in manufacturing salt, and in apparatus for manufacturing salt. Sealed 3rd March—6 months for inrolment.

William Shaw, of Liverpool, for a machine for paging books and numbering documents consecutively, and otherwise, and for printing dates, words, marks, numbers, or impressions, in an expeditious manner. Sealed 3rd March—6 months for inrolment.

Alexander Gordon, of Westminster, for an improvement or improvements in producing motive power by the action and agency of heat, and in the application of that power to purposes of locomotion or navigation. Sealed 3rd March—6 months for inrolment.

Robert Frederick Brown, of Knightsbridge, for certain improvements in the construction of chairs and couches. Sealed 8th March—6 months for inrolment.

George Selby, of Birmingham, for certain improvements in the manufacture of pipes or tubes, of that class or kind which are formed by welding skelps of wrought-iron. Sealed 8th March —6 months for inrolment.

John Sykes, of Hollingwood, Lancaster, and Adam Ogden, of Ashton-under-Lyne, for certain improvements in machinery for preparing and cleaning wool, cotton, and similar fibrous material. Sealed 8th March—6 months for inrolment.

Thomas Wright, of Thames Ditton, Esq., for certain improvements in apparatus for the production and diffusion of light. Sealed 10th March—6 months for inrolment.

Thomas Grubb, of Dublin, civil engineer, for improvements in bank notes, and in machinery connected therewith; parts of which are also applicable to cheques, bills, and other documents. Sealed 11th March—6 months for inrolment.

Archibald Richard Brooman, of Fleet-street, Gent., for certain improvements in the preparation and application of artificial fuels, mastics, and cements. Sealed 11th March—6 months for inrolment.

George Ferguson Wilson, of Belmont, Vauxhall, Gent., George Gwynne, of Regent-street, Gent., and James Pillans Wilson, of Belmont, Vauxhall, aforesaid, Gent., for improvements in the manufacture of candles when palm oil is used. Sealed 13th March—2 months for inrolment.

Robert Barr Purbrick, of Tonbridge, Kent., engineer, for certain improvements in certain apparatus used in the manufacture of sugar, which apparatus is commonly called sugar pans or coppers. Sealed 13th March—6 months for inrolment.

John Blyth and Alfred Blyth, of St. Anne, Middlesex, engineers and copartners, and George Parker Hubbuck, of Ponder's End, Middlesex, engineer, for certain improvements in steam engines, steam boilers, and machinery for propelling vessels, which improvements in steam engines and steam boilers are for the most part applicable to the purposes of steam navigation, but are also applicable to other purposes, for which steam engines or steam boilers are, or may be, used. Sealed 13th March—6 months for inrolment.

Abel Siccama, of Finsbury-pavement, Bachelor of Arts, for improvements in the construction of flutes and other wind musical instruments. Sealed 13th March—6 months for inrolment.

Moses Poole, of Serle-street, London, Gent., for improvements in lithographic presses,—being a communication. Sealed 13th March—6 months for inrolment.

Henry Jones, of Broadmead, Bristol, baker, for a new preparation of flours for certain purposes. Sealed 13th March—6 months for inrolment.

Thomas Dunn, of Manchester, engineer, for certain improvements in, or applicable to, turn-tables to be used on, or in connection with, railways. Sealed 13th March—6 months for inrolment.

Pierre Armand Le Comte de Fontainemoreau, of Skinner's-place, city, for improvements in the process of, and apparatus for, distilling and rectifying,—being a communication. Sealed 13th March—6 months for inrolment.

Christopher Nickels, of York-road, Lambeth, Gent., for improvements in the manufacture of elastic webs and cords, and in the mode or modes of manufacturing articles from the same. Sealed 13th March—6 months for inrolment.

John Ainslie, of Redheugh, North Britain, farmer, for a certain improvement or certain improvements in the apparatus and arrangements for the manufacture of tiles and similar articles from clay or other plastic matter. Sealed 15th March*—6 months for inrolment.

Constant Champion, of the city of London, merchant, for improvements in burning animal charcoal,—being a communication. Sealed 17th March—6 months for inrolment.

Pryce Buckley Williames, of Llegodig, North Wales, Gent., for certain improvements in the manufacture of artificial stone. Sealed 17th March—6 months for inrolment.

John Sellers, jun., of Burnley, Lancashire, cotton spinner, for certain improvements in looms for weaving. Sealed 17th March—6 months for inrolment.

John Cleaveland Palmer, of East Haddam, Middlesex, Gent., for certain machinery to be used in manufacturing certain kinds of tools for boring wood or various other substances. Sealed 17th March—6 months for inrolment.

Henry Grissell and James Lewis Lane, of Regent's-canal Iron Works, engineers, for certain improvements in weighing machines, and also in steelyards. Sealed 17th March—6 months for inrolment.

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* This patent being opposed by caveat at the Great Seal, was not sealed till 15th March, but bears date 18th January last, the day it would have been sealed, had the said caveat not have been lodged against it, per order of the Lord Chancellor.

Edwin Hill, of Bruce Castle, Tottenham, Gent., and Warren de la Rue, of Bunhill-row, manufacturer, for improvements in the manufacture of envelopes. Sealed 17th March—6 months for inrolment.

William Lloyd Caldecott, of Bath, Somersetshire, Esq., for an improvement in the manufacture of soap. Sealed 17th March 6 months for inrolment.

Augustus Coffyn, of Paris, Gent., for improvements in pumps. Sealed 17th March—6 months for inrolment.

Stephen Perry, of Woodland-place, St. John's Wood, Gent., and Thomas Barnabas Daft, of Birmingham, manufacturer, for improvements in springs to be applied to girths, belts, and bandages, and improvements in the manufacture of elastic bands. Sealed 17th March—6 months for inrolment.

Thomas Drew, of St. Austell, Cornwall, chemist, and Edward Stocker, of the same place, merchant, for certain improvements in the production and manufacture of naphtha, pyroligneous acid, or other inflammable matter. Sealed 18th March—6 months for inrolment.

Francis Molineux, of Hackney, Gent., for improvements in apparatus for cutting and dividing sugar. Sealed 18th March—6 months for inrolment.

Henry Samuel Rayner, of Alfreton, Derbyshire, Gent., for certain improved means of preventing accidents to carriages on railways, and common roads. Sealed 18th March—6 months for inrolment.

Anna Maria Stowel, of Gloucester-place, Islington-green, straw bonnet manufacturer, and Thomas Little, of Hoxton Old Town, willow square manufacturer, for improvements in the manufacture of ladies' bonnets or hats. Sealed 20th March—6 months for inrolment.

Louis Theodore Maillard Rochet, of Paris, Gent., for improvements in the construction of ovens, applicable also for the purposes of economizing fuel in furnaces generally,—being a communication. Sealed 20th March—6 months for inrolment.

John Thurston, of Catherine-street, Strand, for improvements in parts of billiard tables. Sealed 26th March—6 months for inrolment.

CELESTIAL PHENOMENA FOR APRIL, 1845.

D.	H.	M.	
1			Clock before the sun, 3m. 56s.
	—		☽ rises 2h. 53m. M.
	—		☽ passes mer. 7h. 37m. M.
	—		☽ sets 0h. 29m. A.
	3	52	Vesta in conj. with the ☉
	22	38	♀ greatest hel. lat. S.
		56	♄ in conj. with the ☽ diff. of dec. 6. 10. S.
3	23	9	☿ in Perihelion
5			Clock before the sun, 2m. 45s.
	—		☽ rises 4h. 34m. M.
	—		☽ passes mer. 10h. 55m. M.
	—		☽ sets 5h. 28m. A.
	15	15	♀ in conj. with the ☽ diff. of dec. 5. 47. S.
	16	41	♅ in conj. with the ☽ diff. of dec. 4. 53. S.
6	7	33	♀ in conj. with ♅ diff. of dec. 0. 50. N.
		40	Ecliptic conj. or ● new moon
	11	6	♃ in conj. with the ☉
6	11	11	♃ in conj. with the ☽ diff. of dec. 4. 34. S.
7			Vesta greatest hel. lat. S.
	16	59	☿ in conj. with the ☽ diff. of dec. 0. 22. S.
8	20	22	♂ in □ with the ☉
10			Clock before the sun, 1m. 20s.
	—		☽ rises 6h. 53m. M.
	—		☽ passes mer. 2h. 54m. A.
	—		☽ sets 11h. 0m. A.
11	9		Vesta in conj. with ♃ diff. of dec. 4. 20. S.
12			Occul *E* 1 Orionis, im. 9h. 15m. em. 10h. 18m.
12	8		☽ in Apogee
14	9	23	☽ in □ or first quarter
14	6	33	☿ greatest hel. lat. N.
15			Mercury R. A. 2h. 46m. dec. 18. 49. N.
	—		Venus R. A. 1h. 5m. dec. 5. 32. N.
	—		Mars R. A. 19h. 40m. dec. 22. 28. S.
	—		Vesta R. A. 1h. 14m. dec. 2. 26. N.
	—		Juno R. A. 9h. 15m. dec. 12. 4. N.
	—		Pallas R. A. 20h. 26m. dec. 11. 27. N.
	—		Ceres R. A. 21h. 47m. dec. 20. 26. S.
	—		Jupiter R. A. 1h. 11m. dec. 6. 28. N.
	—		Saturn R. A. 21h. 20m. dec. 16. 23. S.
	—		Georg. R. A. 0h. 28m. dec. 2. 17. N.
	—		Mercury passes mer. 1h. 12m.
	—		Venus passes mer. 23h. 32m.
	—		Mars passes mer. 18h. 4m.
	—		Jupiter passes mer. 23h. 35m.
	—		Saturn passes mer. 19h. 43m.
	—		Georg. passes mer. 22h. 50m.
15			Clock before the sun, 0m. 1s.
	—		☽ rises 11h. 21m. M.
	—		☽ passes mer. 6h. 52m. A.
	—		☽ sets 1h. 44m. M.
			Occul *A* 2 Cancri, im. 28h. 13m. em. 13h. 54m.
16	16	55	♀ in conj. with ♃ diff. of dec. 0. 16. S.
17	0	49	☿ greatest elong. 19. 49. E.
18	8	58	♀ in conj. with Vesta, diff. of dec. 4. 6. S.
			Occul. *g* Leonis, im. 8h. 15m. em. 9h. 30m.
20			Clock after the sun, 1m. 9s.
	—		☽ rises 5h. 15m. A.
	—		☽ passes mer. 10h. 46m. A.
	—		☽ sets 3h. 42m. M.
22	7	12	Ecliptic oppo. or ○ full moon
24	5		☽ in Perigee
25			Clock after the sun, 2m. 8s.
	—		☽ rises 11h. 23m. A.
	—		☽ passes mer. 2h. 35m. M.
	—		☽ sets 6h. 47m. M.
27	19	56	☿ stationary
28	0	4	♂ in conj. with the ☽ diff. of dec. 6, 23. S.
	11	20	☽ in □ or last quarter
29	7	40	♄ in conj. with ☽ diff. of dec. 6. 25. S.

The satellites of Jupiter are not visible this month, Jupiter being too near the sun.

J. LEWTHWAITE, Rotherhithe.

THE

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No. CLXI.

RECENT PATENTS.

To William Irving, *of Regent-street, Lambeth, engineer, for improved machinery and apparatus for cutting and carving substances to be applied for inlaying and other purposes.*—[Sealed 25th November, 1843.]

This invention consists in certain improved constructions or arrangements of machinery, having a revolving cutter, by means of which, in conjunction with a moveable table, tablets of wood and other materials can be cut away, carved, countersunk, and perforated, in various ornamental forms, with great facility, for the production of inlaid devices, gothic tracery work, and other kinds of ornaments hitherto usually wrought by hand.

In Plate X., fig. 1, represents a side elevation; fig. 2, an end elevation; and fig. 3, a horizontal view of the machinery. A, A, is a bench or table, for supporting the several parts of the machine; B, B, is a standard or bracket-frame, firmly fixed to the said bench; which frame is provided with plummer-blocks and bearings C, C, to receive a spindle D. E, is a forked frame, or swinging arm, firmly fixed upon the spindle D; and the other end of the arm E, is furnished with suitable bearings, which carry, in a vertical position, a spindle F. The lower end of this spindle F, is formed to receive a chuck V, or other suitable contrivance, for attaching and holding securely the tool, drill, or cutter X, or such other cutter as may be required; and upon the spindle F, near its upper end, is fixed a conical pulley G, having grooves of different diameters, for the purpose of determining the velocity with which the spindle shall be made to revolve. This pulley is designed to receive an endless band or cord H, which passes round the lower part of a similar pulley I, running loosely upon the spindle D; the upper groove of the pulley I, is made to receive another endless band or cord K, that passes round a wheel or drum L, supported by a standard or frame N, which is connected, by a similar frame M, to the standard B; but the band K, may be driven by any other means. O, is a horizontal moveable table, mounted upon a vertical shaft R, which passes through the bench A; its lower end being supported by, and turning freely upon, a step or bearing S, in the arch Z, fixed to the framing of the bench. The tablet or slab of wood, or other material, intended to be wrought by the cutter X, is to be placed upon the turning-table, as at P, and made fast thereon by screwed clamps. At the left-hand end of the bench A, there is a vertical bar J, made fast to the wood framing, in which there is a fulcrum-pin for the lever W, to turn upon; one end of this lever W, is formed into a concave socket to receive, as a step, the lower end of the spindle D, before mentioned; and the other end of the lever is connected, by a joint, with a treadle-rod T. This treadle-rod and lever are for the purpose of raising, when required, the spindle D, with the forked frame E, carrying the drill. U, is an adjustable screw, set in the leg of the bench, as a stop to the lever intended to regulate the descent of the spindle D, with the frame E, in order that the cutter X, shall not penetrate deeper into the material, or substance P, than may be desired.

Fig. 8, and the part dotted in fig. 2, represents another arrangement for raising and lowering the spindle D, with the forked frame and drill, instead of the lever and treadle-rod, before described: this arrangement is used when carving of variable relief, such as foliage, figures, &c., is required to be executed.

Upon any convenient part of the standard B, is fixed a frame *a*, with bearings *b*, *b*, to receive and support the axle of a quadrant *c*, which has a lever *d*, attached to its centre. From the periphery of the quadrant *c*, is suspended, by a chain *e*, or other suitable contrivance, the spindle D, carrying the forked frame E, with the drill. To the lever *d*, a weight *f*, is suspended by a rod, or other convenient means, hung in any of the notches provided in the lever for that purpose; which weighted rod acts as a counter-balance to the spindle D, and the several parts attached thereto; thus enabling the cutter X, to be raised or lowered with the greatest facility and precision; all the other parts of the machine, and their action, being the same as hereinbefore described.

Fig. 4, is an elevation, and fig. 5, an under side or end-view of a tool or cutter, for cutting or carving a semi-circular or quarter-round hollow, for mouldings, gothic tracery, &c.; fig. 6, is an elevation, and fig. 7, an under side or end view of a tool or cutter, for cutting or carving a bead and fillet, or astragal. These are only two examples of cutters, but, of course, a great variety may be employed, and these must depend upon the form of the edge of the recess intended to be cut or formed; as any and every variety of rounds and hollows, ovolos, ogees, &c., separately or combined, may be executed, not only in straight lengths, but to the form of any regular or irregular curve that may be desired.

The mode of cutting or carving with this machine is as follows:—Upon the revolving table O, the tablet, slab, or piece of wood, or other material P, to be cut or carved, is fixed; and on its upper surface, when desired, is placed a template or pattern Q, (formed of iron, brass, or other approved material), of the design required to be cut or carved; and the two are firmly held upon the table O, by cramps or cramping-bars, as shewn. Motion being given by any convenient power to the wheel or drum L, or communicated by any other means to the band or cord K, the pulley I, will be made to turn rapidly upon the spindle D; by which means the band or cord H, passed round the pulley G, will cause the spindle F, carrying the cutter X, to revolve with great speed; the velocity of the cutter being determined by the proportions which the diameters of the pulleys G, and I, bear to each other, and the speed of the driving power. The cutter X, being set to the depth of cut required, by adjusting the stop U, the workman presses down the treadle-rod T, with his foot, which causes the lever W, to raise the spindle D, with the cutter X, and the several parts attached thereto; thus the forked arm E, is raised, and being moved round the cutter X, may be passed over the tablet P, in an arc; at the same time the moveable table O, must be turned, so that the cutter may be perpendicularly pendant over the part of the tablet where the work is to commence. The revolving cutter X, is then let down, by removing the pressure from the treadle-rod T, and it immediately penetrates into the tablet. The form in which the cutter moves over the tablet is now to be determined by guiding the shaft of the cutter against the edges of the template or pattern; the table O, with the tablet P, upon it, being moved at the same time, in order to keep the edge of the template always close to the shaft of the cutter. By thus moving the swinging-frame E, and the table O, various arcs of circles, that are constantly tangential to each other, may be traced upon the tablet under operation; thereby enabling every possible variety of regular and irregular curved and straight forms to be cut or carved in the material acted upon; and this combined or simultaneous action forms the principal novelty of the invention.

The patentee claims the combination and application of the several parts, as herein shewn and described, and any variation of that combination or application, for effecting the principle of his invention; provided the swinging-frame, which carries the cutter, and also the table on which the article to be wrought is placed, have both the means of circular motion.—[*Inrolled in the Petty Bag Office, May,* 1844.]

Specification drawn by Messrs. Newton and Son.

To William Edward Newton, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in machinery or apparatus for facilitating the tracing and copying of designs, drawings, and etchings of all kinds, either of the original size, or upon an enlarged or reduced scale,—being a communication.*—[Sealed 16th January, 1844.]

This invention consists in a new application of, or rather a novel method of, employing the camera-obscura. In order to adapt this instrument to copying drawings on the same size, or on a larger or smaller scale, several conditions are indispensible:—1st. The framing, carrying the camera-obscura, must be capable of moving easily in a vertical direction, in order that it may be adjusted to any required point or focus. 2nd. The design to be copied must be placed in a frame, which must have a lateral and also a backward and forward motion, either horizontally or vertically, according to whether the light is received from above, or at the side. 3rd. The apparatus carrying the lens must also be moveable. Motion may be given to the different parts by any suitable mechanical means, such as pulleys and weights, endless screws, racks and pinions, chains and chain-pulleys, or other analogous arrangements which will produce the same effect. The machine must be modified according to the direction in which light is to be admitted, *i. e.*, from above, or at the side.

In Plate XI., fig. 1, shews a machine, in which the light is received from above. It consists of a wooden framing *a, a,* about 8 feet in height, formed of four uprights, placed parallel to each other, at about 4½ feet apart. They are joined by cross-pieces of equal length; four of which are placed at the upper and four at the lower part of the framing, and fastened by screw-bolts. Iron supports are also fixed diagonally to the upper part, in order to render it more secure in the direction of its height. At the upper part of this framework, and upon the first frame or table *c*, an inclined glass *b*, is fixed, to receive the light (which enters the apartment in a horizontal direction) and reflect it perpendicularly down upon the design to be copied, which is placed horizontally upon a plate of glass, as shewn at *d*. At each angle of the frame *c*, two antifriction rollers *e*, *e*, are fixed at right angles, in such a manner, that the eight rollers are at the four interior angles of the four uprights of the framing. An ascending movement is obtained by means of cords and pulleys *f*, *f*; these cords communicate with a weight *g*, which, by its gravity, keeps the frame suspended in such a manner, that it may be very easily raised or lowered, and may be adjusted at any required point or focus, for the purpose of reducing or enlarging the drawing to be copied, or reproducing it of the same size. In the interior of the frame two grooves are made, for the purpose of receiving a second frame *h*, *h*, which is capable of moving laterally between the parts 1, 2. In this second frame two grooves are also made, to receive a third frame *i*, *i*, the movement of which is at right angles to the other, in a horizontal direction. This third grooved frame is furnished with a glass (not silvered or tinned), the position of which forms or determines the area, situation, or position of the frame which receives the design that is to be copied; and the two double horizontal backward and forward and lateral movements, which are effected by the arrangement of the parts above described, afford the means of moving successively all the parts of the design, so that they may all in turn be placed to correspond with the centre of the first frame, which is effected by means of cords and pulleys, under the command of the operator. There is a second frame *j*, capable of moving up and down like the first; it is painted black underneath, and furnished all round with a covering of black stuff *k*, so that no light may enter the interior except that from above, by which means its intensity will be preserved. This second frame may, like the first, be adjusted at any height by cords, pulleys, and weights *l*, *l*, *m*; it is perforated in the centre, to allow the light to pass and to receive a double convex lens *n*, which is fixed in a tube sliding inside another which is stationary, and of about four inches in diameter; it is constructed so as to receive the lens either at the upper or lower part. This tube moves up and down with the frame which carries it; it is also furnished with a rack and pinion for raising and lowering it, for the purpose of regulating the height of the lens and adjusting it, so that the lines of the design, thrown downwards by the light, may pass through the said lens, and be received by the paper upon the table *o*, below. The size of the design to be drawn is previously to be fixed upon the said paper by marking the distances thereon; this serves as a scale for the whole, and also as a guide to regulate the height of the two frames, and of the lens and its moveable tube, so that they may be placed at such distances as to produce the design of the size required.

The design to be copied should be upon varnished or transparent paper, so that the light may pass freely through the same, and that the lines of the design may be projected with clearness and precision. This machine may, nevertheless, be employed for copying and altering the proportions of designs drawn upon ordinary paper, not transparent; it is also applicable to restoring designs executed upon fabrics of any sort; but in this case the glass is dispensed with; the frames for receiving the drawings, which, in the former arrangement were horizontal, are vertical, and must be capable of moving in such a manner, that all the parts of a design may be successively brought into a vertical position opposite a prism, so as to be thereby reflected downwards, and pass through the lens; by which means they are altered and regulated in size at pleasure.

Fig. 2, is a front elevation; fig. 3, a side view; and fig. 4, a plan view of a machine constructed upon the same principle as that shewn in fig. 1; but the arrangements of some of the parts are somewhat altered and modified, so as to admit the light at the side. A frame, which is capable of moving in three different directions, receives the design to be copied or reduced, which is held therein between two plates of glass. The design, as before, must be upon transparent paper; it is placed in a vertical position against the light, which must pass through it before entering the camera-obscura. The frame which contains the design must have three movements, viz., a vertical movement, and a lateral horizontal movement, in order to bring successively all the parts of the design opposite the orifice of the camera-obscura, and another horizontal movement at right angles to the former, for the purpose of bringing the drawing nearer to or further from the camera, in order to reduce it to the required size. The other parts of the machine are similar to those represented in fig. 1. In case it should be required to copy a design on a different scale, from paper which is not transparent, a prism or reflector must be used, as was observed with regard to the machine admitting light from above.

A, A, iron framework for supporting the apparatus; *a, a,* rods or bars connecting the framing; B, a cross-piece, having a female screw *b,* in its centre; C, a horizontal framing, upon which the camera-obscura D, is placed, and supported by two cross-pieces *c, c*; E, a cross-piece, forming part of the framing C, and sliding vertically in grooves F, F, made on the inner sides of the framing A, A. G, is a male screw fixed to the cross-piece E, and working in the female screw *b,* in the centre of the stationary cross-piece B, before mentioned; b^1, is a small horizontal wheel for turning the screw round; *g, g,* are small supports or brackets, for supporting or keeping in a horizontal position the frame C, which supports the camera; H, is a shaft, having at each end a pulley *d,* and pinion *e,* for giving motion to the rack I. J, is a vertical frame, behind the racks I, and carrying pulleys *f, f.* *h, h,* are rods for guiding the frame J, from side to side, by means of the rollers *i, i,* fixed thereon. K, is a frame inside the frame J, and capable of sliding vertically in grooves formed therein; and L, is a table, placed immediately under the aperture of the camera, and upon it the design is produced.

The frame C, receives a vertical movement, by means of the screw G, and a horizontal movement backwards, by means of the pinions *e,* and racks I, I, which receive motion from the cords 1, 1, wound upon the pulleys *d, d*: one of these cords moves its pulley from front to back, and the other from back to front. The frame J, receives a horizontal movement from left to right, and *vice versâ,* by means of the cords 2, 2, fixed at 3, 3, at the back thereof. Lastly, the frame K, is made to slide inside the frame J, by means of a cord 4, fixed at the point 5, and passing over pulleys *f, f,* fixed upon the frame J; this cord 4, is brought to the front by means of small pulleys.

In fig. 2, the dotted lines shew the different positions to which the frames C and J, may be brought by the operator. The cords and weights, above-mentioned, are for the purpose of assisting the movement of the several parts, and are not intended to act independent of the will of the operator; but they are regulated, as to weight and arrangement, in such a manner, that he is enabled, with a slight touch, or very little exertion, to move the parts about at his pleasure, and they will remain stationary at any point where he may leave them.

The patentee claims, as the invention secured to him,—combining and arranging the various parts, so as to construct or form an apparatus for facilitating the copying of drawings or designs, upon the plan herein set forth and described, in which the various parts are rendered capable of adjustment, so as to produce the copy of a larger or smaller size, as may be required; the image or reflection of the object being thrown down upon a sheet of paper, or other material, on which it is traced by hand.—[*Inrolled in the Petty Bag Office, July,* 1844.]

Specification drawn by Messrs. Newton and Son.

To THOMAS MIDDLETON, *of Loman-street, in the borough of Southwark, engineer, for certain improvements in machinery for the manufacture of artificial fuel.*—[Sealed 5th August, 1844.]

THIS invention relates to machinery for pressing and forming artificial fuel into blocks. The improved machine consists of a horizontal wheel, or circular mould-plate, in or on which are formed or placed a series of moulds or recesses, ranging radially round the upper part of the wheel or plate, which is caused to revolve round its centre with an alternating motion. The moulds are consecutively brought under a hopper, and filled with the mixture of ingredients composing the artificial fuel; and by the wheel or mould-plate continuing to revolve, they are also brought consecutively under the pressing part of the machine, where the fuel is properly compressed, and formed into blocks, which are afterwards pushed upwards out of the moulds, and removed from the machine. The circular mould-plate rests upon a fixed circular plate or bed, in which one opening or orifice, corresponding in size and position to the moulds, is formed; and when a mould, with a brick or block therein, comes over this opening, a piston or plunger rises up through the said opening in the bed-plate, and pushes out the block of fuel.

In Plate X., fig. 1, represents a plan view of the machine, and fig. 2, is a side elevation of the same. The wheel, or circular mould-plate, in or on which the moulds are formed, is seen at *a*; and *a**, is the circular bed-plate, on which the mould-plate moves, as before mentioned. *b*, is the main or driving-shaft of the machine, mounted in bearings at *c*, *c*, and carrying the fast and loose pulleys or drums *d*, *d*, and the fly-wheel *e*; a small pinion *f*, is also mounted on one end of the shaft, and gears into and drives the large toothed-wheel *g*, on the crank-shaft *h*, which is mounted in bearings on the upper end of the side standards *i*, *i*. On the outer end of the shaft *h*, one of a pair of mitre-wheels *j*, *j*, is mounted; the corresponding wheel *j*, is mounted at the upper end of the vertical shaft *k*, which turns in bearings connected to the side standards, and carries at its lower end a pair of cams *l*, and *m*, for the purpose of actuating that part of the machine which causes the rotation of the mould-plate *a*. The rotation of the mould-plate is effected in the following manner:—A vibrating arm or lever *n*, having its centre of motion at *o*, is furnished at its outer end with a pall or click, which takes into the ratchet-teeth *p*, *p*, on the side of the mould-plate *a*; a rod or beam *q*, with a slotted end, connects the arm or lever *n*, with the cams *l*, and *m*, on the vertical shaft *k*. The slotted end of the rod *q*, embraces the lower extremity of the shaft *k*, and is furnished with antifriction rollers *r*, *r*, which bear against the cams *l*, and *m*; as the vertical shaft *k*, rotates, and carries the cams round with it, the lower cam *l*, forces out the rod *q*, and by that means draws forward the vibrating arm or lever *n*, thereby causing the mould-plate to turn round the distance of one mould; it then becomes necessary to push the arm or lever *n*, back into its original position; this is performed by the cam *m*, which comes into contact with an antifriction roller connected to the rod *q*, and drives the latter back. The pressing operation is effected by means of the toggle-joint *s, s*, to the lower end of which a plunger *t*, is attached,—a front elevation of this part of the machine is shewn at fig. 3; some of the parts, such as the mould-plate *a*, and circular bed-plate *a**, being shewn in section. The plunger is made to descend perpendicularly, by means of the guides and guide-bars *u*, and *u**, attached to or formed on the side standards. A connecting rod *w*, is attached at one end to the middle of the toggle-joint, and at the other end to the crank of the shaft *h*, and therefore, as the crank revolves, it straightens the toggle-joint, and causes the plunger to descend into the mould, and compress the fuel; then, when the plunger is raised out of the mould, the circular mould-plate is moved round one tooth, thereby bringing another mould beneath the plunger. When the blocks of fuel have been formed in the mould, and properly compressed, they are forced out by means of a piston *x*, (see fig. 2,) actuated by the lever *y*. This lever is mounted on a centre (as seen in the drawing), and its other end is, by means of the rod *z*, connected to, and worked by, a part of the apparatus connected with the plunger. It will now be seen, that when the plunger descends, and compresses one block in a mould, and thereby depresses one end of the lever *y*, the opposite end of this lever is raised, and a block of fuel is thereby forced out of one of the moulds, from which it is then removed by hand.

The patentee claims, as his invention, the employment of a toggle-joint, for the purpose of compressing the fuel in the moulds; and also, the arrangement or disposition of the several parts of the machine, whereby the various motions of the apparatus are effected, as above described.—[*Inrolled in the Petty Bag Office, February,* 1845.]

Specification drawn by Messrs. Newton and Son.

To James Insole, *of Birmingham, in the county of Warwick, saddler's ironmonger, for improvements in the manufacture of brushes.*—[Sealed 8th September, 1842.]

These improvements in the manufacture of brushes consist, Firstly, in covering or coating, wholly or partially, with leather, or other waterproof substance, the wooden stocks or backs, into which the bristle, hairs, or other materials for brushes, are inserted; such covering being for the purpose of protecting the wood from the injurious effects of damp; and also, for preserving the wires or strings, by which the bristle, hairs, &c., are secured in the brush, from the corrosive or rotting effects of the damp. Secondly,—in certain novel and peculiar forms of brushes, designed for cleaning horses and carriages, whereby the brushes are rendered more convenient and better adapted to the several parts of the work to which they are applicable.

In Plate XII., fig. 1, represents a brush for dressing or cleaning horses, the stock or back of which is made in the form of an egg-shaped oval. This form of brush (when a back-strap is affixed to it for the reception of the hand) will be found to be particularly useful in cleaning and dressing horses, in consequence of the narrow end of the brush admitting of its introduction into the hollows or recesses in the body of the animal. Fig. 2, shews a peculiar form of straight taper water-brush for cleaning the feet and legs of horses; this brush being smaller at one end than at the other, affords ready access to the hollows and recesses of the horse's feet.

These, as well as other forms of brushes, are protected from the injurious effects of damp, by wholly or partially coating or covering their wooden stocks or backs with leather, or other suitable material, which is nearly or perfectly impervious to water. Fig. 3, exhibits a vertical section taken transversely through the stock of the egg-formed brush, shewn at fig. 1. *a*, is the wooden stock, which is first to be covered on the face, side, or belly, with leather, or other material of a waterproof nature, *b*, which is to be attached to the wood by a cement, made principally of caoutchouc. The bristles *c*, *c*, are then to be inserted through the face leather into the wooden stock, and made fast therein, in the usual way, by wires or strings. When the brush has been so far made, an outer coating of leather, or other suitable substance, *d*, is to be cemented to the back of the stock, and the edge neatly stitched round; or, when the back has a flat edge, and the pieces of leather do not meet, the leather *d*, may be pinned round the edge, to keep it securely attached.

Fig. 4, is a vertical section of a modification of the above, suited to the form of water-brush shewn at fig. 2. In this instance, the leather, or other suitable waterproof material, *b*, is attached to the face of the wooden stock *a*, as in the preceding brush; and after the bristles have been inserted, the back of the stock is covered with wood *e*, pinned on in the usual way. Sometimes the stock is made by inserting the leather, or waterproof material, *b*, between two thicknesses of wood; but this modification does not possess all the advantages of the previously described plans.

Fig. 5, represents a spoke or wheel-brush, for washing carriages, and fig. 6, is a transverse section of the same. The stock, or wooden back, having been suitably shaped, is first covered on the inner face, or belly, with leather, or other suitable waterproof material, connected to the wood by cement. Holes are then bored through the leather and wood, and the bristles inserted in the usual way, as shewn in the section. A cap-piece of wood *e*, of a triangular sectional form, is then cemented to the back of the stock, and the edges of the leather, or other material, *b*, closed up over the whole of the back, and cemented, pinned, or neatly stitched along the ridge, as shown.

Figs. 7, and 8, represent different views of another spoke or wheel-brush, of a peculiar and novel form, possessing the advantages of broad and narrow ends, as already described in reference to figs. 1, and 2. The construction of this form of brush, and the mode of protecting its wooden stock from the effects of damp, may be the same as already described in reference to figs. 4, 5, and 6.

The patentee claims, as his invention, the modes of protecting the wooden stocks or backs, and the fastenings of the hairs, bristles, or other materials, employed as such in the construction of brushes generally; by coating, covering, or lining the parts, as described, with leather, or any other substance which is capable of resisting water, and thereby preserving the wood and fastenings of the brush from the injurious effects of damp. And he also claims the peculiar and novel forms of brushes for cleaning horses and carriages, shewn at figs. 1, 2, 7, and 8.—[*Inrolled in the Petty Bag Office, March,* 1843.]

Specification drawn by Messrs. Newton and Son.

To ALEXANDER TURNBULL, *of Russell-square, in the county of Middlesex, doctor of medicine, for a new mode or method of more expeditiously and effectually tanning hides and skins, and of extracting and separating the catechuic acid from the tannic acid in the catechu or terra-japonica used in tanning.*— [Sealed 26th September, 1844.]

IN tanning hides and skins it is very difficult to bring the tannin or tannic acid immediately and effectually into contact with the gelatinous fibre of the skin, which arises from several causes, viz.: First,—the skins and hides are deprived of the hair and epidermis, by steeping them in a solution of lime; in this process they imbibe a considerable quantity of lime, which has the effect either of removing a portion of the gelatinous substance, in the form of soluble gelatine, or of altering the gelatinous fibre, so as to render it incapable of speedily and effectually combining with the tannin or tannic acid; and the pores of the skin are so impregnated with lime as to prevent the tanning principle from operating freely, or reaching the heart of the skins. Secondly,—when terra-japonica or catechu is used in tanning, the leather is very permeable to water, light, spongy, and of a dark reddish color; this is occasioned by the catechu or catechuic acid, or other deleterious extractives, which are to be found in the terra-japonica. Thirdly,—when oak-bark and the other materials used in tanning (especially oak-bark, *divi-divi*, and sumach) are mixed with water, for the purposes of tanning, they generate, by the action of the atmospheric air, gallic acid, which is a solvent of gelatine, and, therefore, injurious in tanning; it also produces an expansion of the pores of the skins,—and, as it does not cause the tannic acid to unite with the gelatine, the leather, thus produced, is light, porous, and of an inferior quality. The chief object of this invention is, to remove these obstructions and difficulties, and bring about a speedy and effectual combination of the gelatinous fibre of the hides or skins and the tanning matter.

The first part of this invention consists in removing the first of the above difficulties, either by extracting the lime with which hides and skins are impregnated; or, by taking off the hair and epidermis from the hides or skins, without the use of lime, by means not hitherto attempted.

Sugar or saccharine matter, whether obtained from the sugar-cane, maple, or other woods, honey, beet-root, turnips, potatoes, or other vegetable substances, possesses the property of dissolving lime; and so does pyroxylic or wood-spirit. For the purpose, therefore, of extracting the lime with which skins are impregnated, a solution is prepared, consisting of sugar, saw-dust, and water, in the proportion of 14 lbs. of saw-dust, and 4 lbs. of coarse sugar or molasses, to 60 gallons of water. The solution may be made of saw-dust alone, in the proportion of 28 lbs. to 60 gallons of water; or it may be made of any other substance containing saccharine matter, such as beet-root, potatoes, turnips, honey, &c.; but the solution first described is preferred: the solutions may be made with cold or warm water; but, if made with warm water, they should be allowed to cool before being used. The hides or skins are steeped in the solution from two to four days; by which means the lime is entirely removed, the skins are rendered fit to receive and imbibe the tannic acid, and the operation of tanning is perfectly accomplished in a very short time.

The methods by which the patentee removes the hair and epidermis from hides and skins are, first,—by steeping them in a solution of sugar, or other saccharine matter, whether obtained from honey, potatoes, beet-root, wood, or any other substances; secondly,—by steeping the hides and skins in a solution of muriate of soda. In the first method, the sugar or saccharine matter, being brought into contact with the hides or skins, causes the gelatine or true skin to expand; and, without acting upon or causing any injury to the gelatinous fibre of the hides or skins, loosens the epidermis, and renders the removal of the hair very easy. In the second method, the mixture of muriate of soda and water contracts the epidermis, without acting upon the gelatine, and separates it from the true skin, so that the hair can be easily removed without injuring the gelatinous matter that forms the basis of the leather. The solution of sugar is composed of 14 lbs. of coarse sugar or molasses to 100 gallons of water, and is kept at a temperature between 50° and 80° Fahr.: the skins are immersed in it from 5 to 10 days. The solution of muriate of soda is formed by adding 14 lbs. of common salt to 100 gallons of water, and is kept at a temperature between 70° and 100° Fahr.: the skins are immersed in it from 3 to 6 days.

The next part of this invention consists in removing the other difficulties above-mentioned, by separating the japonic or catechuic acid, and other deleterious matters to be found in terra-japonica, from the tannic acid; and also, by preventing the formation of gallic and ellagic acids, when oak-bark, *divi-divi*, *valonia*, and other tanning materials are used.

The separation of the tannic acid from the catechuic acid, &c., is accomplished by grinding catechues into fine powder, and mixing the powder with warm or cold water, until it is thoroughly dissolved; and, when cold, pouring the liquid into a large cylinder or tank, having a bottom of fine wire-gauze, calico, linen, or other porous material; by this means, the catechuic acid and extractive and other deleterious matter to be found in catechues, are retained, by reason of their being insoluble in cold water; and a pure tannin liquid, freed from these injurious ingredients, is obtained. This purified liquor will be found much more effectual in preserving sails of vessels, and linen cloths exposed to the weather, than the terra-japonica, as now used.

To prevent the formation of gallic and ellagic acids, which, by the action of atmospheric air, are generated in the tannin liquor, when it is composed of oak-bark, *divi-divi*, *valonia*, and other tanning materials, the patentee grinds the materials into fine powder, and prevents the atmospheric air from acting upon them, while the process of tanning is going on, in the manner hereinafter described under the improved modes of tanning.

The hides or skins being prepared in the manner above described, and well washed and cleansed, the patentee proceeds to tan them by two different modes,—first, by the application of a new physical force, different from ordinary capillary attraction, or hydrostatic pressure; and secondly, in pits or tanks, communicating with each other in such a manner, as, by the means hereafter described, to keep up a general and constant agitation and circulation of the tanning liquor, until the hides or skins are tanned.

The patentee here observes, "that when two liquids, of different densities, are separated by a membrane or *septum*, two opposite currents are established in contrary directions, the one outwards, and the other inwards; the greater current passes through the membrane, and accumulates on the side where the liquid is of the greatest specific gravity, on whichever side of the membrane it may be placed; and the lesser current flows through the membrane to the opposite liquid; and these interchanges continue acting, until such time as the specific gravity of the fluids on each side of the membrane becomes alike, unless a chemical change or obstruction takes place to prevent it. The current, in one direction, is called *endosmosis*—that in the opposite direction, *exosmosis*." This physical force is now proposed to be applied to the tanning of hides or skins in the following manner:—The hide or skin to be tanned is formed into a bag by sewing, and the oak-bark, which has been ground into powder, is introduced, in the proportion of two pounds to every pound weight of the wet skin, prepared as above; the opening through which the oak-bark has been introduced is then sewn up, leaving only a small neck or aperture, through which the bag is filled with cold or warm water; and, when full, the neck or aperture is fastened by a flange and screw, so as to exclude the atmospheric air. The bag is then introduced into a box filled with tanning liquor, formed of terra-japonica, which has been freed, as above described, from catechuic acid and extractives. The boxes are arranged in the manner shewn at fig. 1, in Plate XI.; A, being the tanks or boxes; and B, the waste-pipes to carry off the liquor, as it exudes from the hides, into the main-pipe C, leading to the main tank or reservoir D. The purified terra-japonica is not injuriously acted upon by the atmosphere; and the tannin liquor, composed of oak-bark, being mixed inside the hide or skin, and thus excluded from the action of the atmosphere, does not generate gallic acid. In order to increase the specific gravity of the liquor in the boxes or tanks, and thus accelerate the action, sugar is added, in the proportion of 14 lbs. to 100 gallons of the mixture of terra-japonica. The two liquids, being thus separated, the process of *endosmosis* and *exosmosis* is secured, and the tannic acid passes rapidly through the skin or hide, until it is perfectly tanned; the bags are turned occasionally, and when they become partially empty, by exudation, are filled again with water. During the operation of tanning, it will be necessary to add to the weight of the liquor in the boxes, in order to keep up the action; this is accomplished by adding a small quantity of sugar to the mixture of terra-japonica. Valonia will rank next to purified tannic acid from terra-japonica, and may be used similarly to terra-japonica; ground valonia may be introduced into the bag, in the proportion of about one-half less than the oak-bark; divi-divi, sumach, and other substances containing tannic acid, may be used in the same proportions as valonia. Terra-japonica ought to be introduced into the bag, after the impurities are removed, in the form of tan liquor, in the proportion of 50 lbs. to the hide:—1 lb. of terra-japonica is equal to 4 lbs. of oak-bark.

Fig. 2, represents the pits or tanks for tanning, arranged so as to create and keep up a general and constant agitation and circulation of the tanning liquor. Into these pits or tanks is introduced a sufficient quantity of tanning liquor, composed either of terra-japonica, or oak-bark, divi-divi, valonia, sumach, &c., so as to leave room only for the hides and skins which are placed therein, one upon another, as in the ordinary mode of tanning; and the pits are then closed at top, so as to exclude the atmospheric air. The tanning liquor must then be put into, and kept in a state of constant agitation or circulation; this is effected by means of a suction-pump, connected with the pits at the bottom and top. A, is the suction-pump; B, B, the pits; C, suction-pipe; D, D, pipes leading from the bottom of the pits to the suction-pipe; E, main-forcing-pipe, connected with the top of the pits by the pipes F, F; and G, G, are pipes which connect the pits with each other at top, to prevent them from overflowing. By the action of the suction or forcing-pump, the tanning liquor is speedily extracted from the pits, through the pipes D, D, and C, and, at the same time, is forced again through the pipes E, and F, F, into the different pits; thereby keeping up a general agitation and circulation of the liquor. These pits or tanks may be constructed in sheds or rooms, and placed one above another, and side by side; but if it is desired to sink the pits in the earth, they should be constructed and arranged as shewn at fig. 3, in which the same letters are used to denote similar parts to those in fig. 2. The operation of both arrangements is the same, with this exception, that, as in fig. 3, the pits are sunk in the ground, the pipes, by which the liquor is withdrawn, are obliged to enter at the top, and descend nearly to the bottom of the pits.

In treating terra-japonica, for the purpose of separating the tannic acid from the catechuic acid and other extractive and deleterious matter, the deposit, remaining in the cylinder or tank, is at least 50 per cent. of the quantity of terra-japonica dissolved; and it is capable of being purified, and rendered applicable to tanning. For this purpose, it is placed in stoves or drying pans, heated to 160° Fahr., and is exposed to the atmospheric air, and kept continually stirred, until it assumes the color and appearance of the original pulverized terra-japonica; this material being now filtered, will be found to yield nearly as much tannic acid as the terra-japonica did in the first instance.

Hides and skins from which the lime has been extracted, or from which the hair has been removed without the use of lime, by the above modes described, may be tanned in the ordinary manner, by terra-japonica, purified as above, and by other ordinary tanning matter, with much greater facility than heretofore; and leather of greater weight, and better quality than usual, will be produced.

The patentee claims, Firstly,—extracting the lime with which hides and skins are impregnated, in removing the hair, by the application of sugar, or other saccharine matter, whether obtained from honey, saw-dust, turnips, potatoes, or other substances. Secondly,—removing the hair or epidermis from hides and skins, without the use of lime, by the application of sugar, or other saccharine matter, whether obtained from potatoes, saw-dust, beet-root, turnips, or other substances. Thirdly,—removing the hair or epidermis from hides and skins, without the use of lime, by the application of muriate of soda or common salt. Fourthly,—separating the japonic or catechuic acid, or other extractive or deleterious matter, from the tannic acid in terra-japonica. Fifthly,—obtaing tannic acid from the refuse or deposit of the terra-japonica in purifying terra-japonica. Sixthly,—preventing the formation or generation of gallic and ellagic acid, when oak-bark, sumach, divi-divi, valonia, and other materials are used. Seventhly,—the improved mode of tanning leather, by means of *endosmosis* and *exosmosis*, with the materials, and in manner before described, without the aid of hydrostatic pressure. Eighthly,—the improved mode of tanning, by means of a general and constant agitation and circulation of the tanning liquor, composed of the materials before mentioned, from top to bottom, and from bottom to top of the pits. Ninthly,—the improved method of tanning hides or skins in pits, in the common and ordinary manner, by first extracting the lime from the hides, or removing the hair without the use of lime, and using terra-japonica, when purified, or other tanning liquor, prepared in the manner before described.— [*Inrolled in the Rolls Chapel Office, March*, 1845.]

To JAMES CARTER, *of Delabole, in the county of Cornwall, slate merchant, for improvements in cutting slate for roofing and other purposes.*—[Sealed 27th September, 1844.]

THIS invention consists in machinery for cutting the edges of slates perfectly straight, and at right angles with each other; thereby preventing the under sides from shelling or chipping off, as is the case when cutting slates by hand.

In Plate XI., fig. 1, is a side view, and fig. 2, an end view of the machine. *a*, is a wheel, which is caused to revolve by a band from a steam-engine, or other prime mover passing around the pulley *b*, on its shaft *c*; and to the outer end of one of its arms a steel cutter *d*, is bolted; the face of the cutter being six inches from the wheel, to allow room for the irregularities of the slate in an uncut state. *e*, is an under-cutter or rest, upon which the slate is to be cut; it is fastened to the frame *f*, and its upper edge is level with the centre of the shaft *c*. The face of the cutter *d*, passes the face of the rest *e*, at one-sixteenth of an inch distance; and the edge of the cutter *d*, meets the slate at an angle of 8°. A guide *g*, is fixed on the frame *f*, at right angles with the face of the rest; and a scale of inches is marked thereon, commencing from the rest;—*h*, is a guide to prevent the vibration of the fly-wheel.

The patentee claims the mode of cutting roofing-slates with the edges perfectly straight and at right angles with each other; whereby he prevents the shelling off, on the under side, of large portions of the slate, which is unavoidable in the old process of cutting by hand—[*Inrolled in the Inrolment Office, March,* 1845.]

To ANTHONY LORIMIER, *of Clerkenwell-close, in the county of Middlesex, bookbinder, for certain improvements in the apparatus and means of facilitating drawing from nature or models.*—[Sealed 3rd July, 1844.]

THE object of this invention is to facilitate the copying or drawing of models, and objects which are naturally stationary, or can be kept so for a few minutes. The means employed by the patentee for effecting this object, consist of a sheet of paper, parchment, vellum, or metal, perforated with from 2000 to 5000 holes per square inch, and fixed in a frame; or, instead of the above materials, the sheet may be composed of gummed or stiffened taffeta or silk, thin sheet caoutchouc, or any material or substance of a sufficiently firm texture to receive and exhibit the required perforations. The perforated sheet being placed vertically between the object or scene to be drawn or copied and the eye of the operator, a view of the object or scene is obtained, by transmission through the holes in the sheet, with sufficient distinctness to enable the operator to trace it in outline upon the inner surface of the sheet.

The drawing in Plate X., represents an apparatus for holding the perforated sheet while being used. The sheet is mounted in a frame *a*, with a pane of glass behind, to hold it in a flat and even state, and support it against the pressure of the pencil; *b*, *b*, are standards that rise from the framing *c*, and support the frame *a*; and *d*, is an inclined shelf or platform, for the arm of the operator to rest upon. The operator's eye should be about eighteen inches from the sheet, and exclusively directed to the object, and not to the surface of the sheet; or, in other words, the eye must be adjusted to the distance of the objects under observation, and not to the surface of the sheet, or the point of the pencil: the action of the latter being, in fact, to be felt by the operator, rather than observed. The object is to be traced with a blacklead pencil, if the sheet is white, or of a light color; or with a crayon of hard white chalk, if the sheet is black, or of a dark color. The sheet should be white, or of a light color, when it is required to copy the drawing afterwards, by means of transparent tracing paper, for the purpose of preserving it, or of transferring it to drawing paper, in order to make a finished picture; but when such transfer is not required, the sheet should be black, or of a dark color, as a more distinct view of the object is thereby obtained.

In conclusion, the patentee says, "I now declare that I claim, as of my invention, in the apparatus and modifications thereof, as I have hereinbefore described and designated them, the use and application of a finely puncturated thin plane, of any substance or material fit for the reception of such fine puncturations, as hereinbefore described, to the practical optical purpose of tracing on one of the surfaces of such plane the imaginary outlines of objects, as seen apparently coincident with or through such puncturated plane. I claim such practical applications of such planes, so treated by puncturation, to the optical purpose aforesaid, together with the general practical mode of making such application, as hereinbefore described, irrespective of any particular manner of arranging the same. Further declaring that I do not claim any particular or specific mechanical arrangement for the formation and production of such puncturations, in or through sheets or planes of the substances hereinbefore described; but I do claim, as of my invention, the practical optical uses and applications of such puncturated planes, when produced for and as regards the purposes and objects hereinbefore stated, specified, and designated, as I have so specified and designated them."—[*Inrolled in the Inrolment Office, January,* 1845.]

To William Edward Newton, *of the Office for Patents,* 66, *Chancery-lane, in the county of Middlesex, civil engineer, for certain improvements in apparatus for propelling vessels,—being a communication.*—[Sealed 25th December, 1843.]

This invention consists in constructing the paddle-wheels of vessels, to be propelled by steam or other power, with paddles capable of sliding into and out of recesses provided for them in a hollow drum or cylinder, which constitutes the body of the wheel; and in placing the said wheels, thus constructed, in cases built in the vessel, and open at bottom, to allow of the wheels projecting a little below the bottom of the vessel. The motion of the paddles is governed in such a manner, by excentrics or cams, attached to the sides of the cases in which the wheels are placed, that the outer edges of the paddles do not project beyond the periphery of the drum or cylinder in which they are enclosed, except in that part of its circuit which passes below the bottom of the vessel, or that portion of its diameter which corresponds or is equal to the immersion of the common paddle-wheel; and at this time and place they are protruded a sufficient distance to propel the vessel.

In Plate XII., fig. 1, represents a stern elevation of a vessel, shewing the paddle-wheels on each side of the keel, and projecting below the bottom of the vessel; fig. 2, is a side elevation of a portion of the same, the dotted lines in the two figures shewing the remainder of the wheels in the vessel, and also the cases in which they work; fig. 3, is a transverse section of the vessel, just behind the trunks in which the wheels work; fig. 4, is an end elevation of one of the wheels; fig. 5, is an elevation of the same, as seen from the bow or stern of the vessel; fig. 6, is a view of the inside of the drum in which the paddles work, with one of the side-plates, and all the paddles removed; fig. 7, is a longitudinal vertical section of the drum, through the axes, with one paddle in its place, and projecting out, and the others removed; fig. 8, is an elevation of the wheel in its case, with one end of the trunk or case removed; fig. 9, is a longitudinal section of the cam groove-plate, which governs the motion of the paddles; and fig. 10, is a cross or transverse section of the same. The remaining figures represent the various modes of applying the principle, and will be referred to hereafter.

The paddle-wheel, instead of being constructed with arms attached to a shaft, and having the paddles permanently fixed to them, consists of a hollow drum or cylinder, made of metal or wood, the peculiar construction of which is exemplified by figs. 6 and 7. *a, a,* are two discs, properly strengthened on the inside by arms *b, b,* if made of wrought-iron, or by means of ribs, if made of cast-iron. In each of these arms, which are equal in number to the number of paddles, there is a slot *c, c,* formed for the paddles to slide in. The two discs *a, a,* are united together by means of staves or plates *d, d,* and *e, e, e,* the former constituting the periphery of the drum or cylinder; each stave or plate reaching from one slot to another, in the direction of the circumference, leaving the slots or openings *c, c, c,* in the periphery, to correspond with those in the discs; and the latter, by uniting the arms or ribs on one disc with those on the other, along the sides or bottom of the slots, form the recesses for the paddles. The union of the discs by the staves or plates *d, d,* and *e, e,* should be effected with the view of making the whole firm and strong, in a manner well known to all good workmen.

On the outside of each disc, and over the recesses for the paddles, plates *f, f,* (see fig. 4) are bolted, for the purpose of preserving or maintaining with exactness the spaces left for the paddles, so as to prevent them from either binding or creating any tremor or vibration; and these plates *f, f,* may also be used as guides for the paddles; or, in place thereof, the paddles may be guided by means of projections *g, g,* (see fig. 7,) fixed on the face of the plates which form the recesses for the paddles: these projections are furnished with V grooves, in which ribs *h, h,* connected to the paddles, slide. The paddles *x, x,* may be made in any manner to suit the fancy of the constructor, as regards materials and mode of stiffening; but it is preferred that they should be made of cast-iron and wood, with the upper part *i,* of greater thickness than the body (each end being properly formed to receive an antifriction roller *j, j*); and the plate, whether of iron or wood, which forms the body, will be stiffened by the before-mentioned ribs *h, h.* It should be observed, that when the ribs *h,* are used as sliding-ways for the motion of the paddles, the plates *f, f,* are not to be employed as guides.

The manner of protruding the paddles beyond the periphery of the drum, and drawing them in, will be hereafter described.

The wheels, constructed as above explained, are placed in hollow trunks or cases *k,* (see fig. 8) built in the vessel in the following manner, viz.: a hole is made through the bottom of the vessel, on each side of the keel, in area something longer than the area of the longitudinal section of the drum of the wheel; and the hollow trunks or wells, in which the wheels work, are built up from the edges of these holes, and reach above the water-line, when the vessel is laden.

The extension of the trunks above the water-line is not absolutely necessary, although it is preferred that they should be thus extended. These trunks or cases should be made of sufficient strength to resist the thrust and jar of the engines and all the machinery, and should also be water-tight. The top of the trunks may also be made moveable, to facilitate getting to the wheels for repairs; and when the top or lid is placed in its proper position, it may be rendered air and water-tight, or not, as desired. The situation and forms of these trunks or cases are represented in fig. 3, which also shews that part of the wheel projecting below the bottom, and, by dotted lines, the part inside. Figs. 1, and 2, also represent the trunks and wheels by dotted lines, and the projection of the wheels below the bottom of the vessel. Fig. 8, represents one of the wheels within its trunk or case; one end of the trunk being removed, in order to represent the wheel in its place. In this figure it will be seen, that one end of the shaft *l*, does not pass through the side of the trunks, the gudgeon working in a box properly prepared for its reception; but the other end passes through the side of the trunk, for the purpose of receiving the crank by which the wheel is driven; and this end of the shaft works in a stuffing-box *n*, of the usual construction, to prevent the water in the trunk from leaking into the vessel;—the lower edge of that end of the trunk which is towards the stern (and, if desired, both ends) may be rounded, as represented by dotted lines in fig. 2.

On each side of the wheel there is a plate of iron *o, o*, firmly bolted to the sides of the trunk or case; and in each of these iron-plates there is a cam or excentric groove *p, p*, in which the rollers *j, j*, work; this groove should be of sufficient width and depth, to prevent the rollers from touching the bottom and the two sides at the same time. From the point 1, to the point 2, in the direction of the arrow, the groove is concentric, and from 2, to 1, it is excentric; the amount of its excentricity depends upon the distance the paddles are required to be protruded beyond the periphery of the drum, as it must be evident that the form of these grooves will govern the position of the paddles, as regards their distance from the centre of the drum during a revolution. In fig. 4, the paddles are represented in the position which they would be made to assume if the rollers were in the grooves. It should be observed, that the diameter of the concentric groove, from 1, to 2, should be such, in regard to the position of the rollers, that, during the revolution of the drum, the ends of the paddles, along that part of the circuit, will be even with the periphery of the drum; and the points 1, and 2, at which the groove assumes the excentric form, depend upon that part of the circuit at which it is desired that the paddles shall begin to be forced out and drawn in. The part of the groove from 3, to 4, can also be made concentric, and unite the two excentric parts; and, in that case, the ends of the part *i*, of the paddles, which extend beyond the side edges, and within the rollers, should be made to rest upon the plates *f*, *f*, and thus relieve the antifriction rollers, and avoid the friction consequent upon the working of the rollers in their grooves.

In the arrangement above described, should the wheels, or their appendages, get out of order, they could not be repaired, except by raising the wheel out of the water. To overcome this difficulty, with a cam-plate of the construction above described, instead of having the shaft of the wheel to work in and pass through the sides of the trunk, the whole is arranged in the manner represented at fig. 11, which is a plan of the trunk or case and wheel, and all its appendages, with the top of the trunk removed; and by means of which it may be drawn up at will.

A recess is made in each side of the trunk, extending from the top to near the bottom, to receive sliding-frames or plates *r*, *r*, one of which is represented detached, and in elevation, at fig. 12. The side edges of the sliding-frames are rabbetted or cut out at *s*, *s*, in order to slide in grooves formed by the plates *t*, *t*, which are bolted to the sides of the trunk or case, and thus complete the sliding-ways or grooves, which only allow of an up-and-down movement of the sliding-frames *r*, *r*. A box *u*, is made in each sliding-frame, to receive the gudgeons of the shaft of the wheel; and around these boxes are made the grooves *p*, *p*, in which the rollers of the paddle work, as before mentioned. One end of the shaft of each wheel is provided with a pinion *m*, (see fig. 11) for the reception of which an additional recess *v*, is made in one side of each of the trunks or cases. The crank-shaft of the steam-engine passes through a stuffing-box, in that side of the trunk which has the recess for the pinion *m*, on the shaft of the wheel, and is itself provided with a pinion, which cannot be seen in the drawing, but which gears into it, and thus forms the connexion between the paddle-wheel and the crank-shaft of the engine. This connexion between the crank-shaft of the engine and the shaft of the wheel can be effected by any of the means known to all persons skilled in mechanics; and, therefore, they need not be more particularly described. Provision should be made for keeping or holding the sliding-frames down to a proper position, to insure the parallelism of the wheel and crank-shaft, and the proper gearing of the cogs of the pinions: when this arrangement of parts is employed, the tops of the trunks or cases should be made moveable.

Instead of the sliding-frames or plates, above-described, a frame, cast in two parts, as represented in fig. 15, may be adopted. The upper part *a, a, a*, is made to fit on to the lower part *d, d, d*; which lower part is cast in such a way as to become at once the cam-groove for protruding the paddles, in the manner above explained; the bearings and supports of the journals for the wheels also form a part of the casting, or are connected thereto. It is formed much like the frames of the shafts for steam-engines, with the addition of the cam-groove, and is bolted on to the bottom of the vessel at *e, e*, within the trunks or cases; but may stand independent of them, or, for greater firmness, may be bolted to them. In order to get at the wheels, for the repairs of the paddles, it is only necessary to take off the upper half *a, a*, and the wheel can at once be turned round till the injured paddle is found, and taken out or repaired. If it becomes necessary to raise the wheel out of its place, this is easily effected, by taking off the upper part *c*, of the bearing which covers the shafts; then, after taking out the paddles, the wheel can be lifted out on deck, if desired—there being, of course, a slide made in the side of the trunk for the shaft; the parts *b, b,* in this figure are merely diagonal braces, for the better support of the wheels.

Various modes of working the paddles could be described, as substitutes for the above, but constructed essentially on the same principle as the one already described; as, for instance, the two represented by figs. 13, and 14. Fig. 13, represents the substitution of an excentric ring *w*, which communicates motion to the paddles *x, x,* by means of connecting rods *y, y,* which are hinged to the paddles, about the middle of the edges thereof. The excentric ring must be so regulated with the motion and position of the drum, as to insure at all times the relative position of the paddles. Or the paddles, instead of sliding in and out radially, can have one edge hinged to the drum, as at *z, z,* fig. 14; the other edge being hinged to the connecting-rods *a, a,* which receive motion from excentrics or cam-grooves, as above described for the other paddles; but the mode first described is believed to be the best. The paddle-wheels, thus constructed, can either be made to work vertically or horizontally, or at any line of inclination.

For the purpose of withdrawing all the paddles within the wheel, so that they may present no obstruction to the sailing of the vessel, the inventor employs a concentric circle or groove, with a switch, as at *a, a,* in fig. 16, or as at *b, b,* in fig. 17; which switches turn on centres, and are worked by means of a rod, running through the casing. By laying down the switches, so as to bring their upper ends to the points *e, e,* the rollers of the paddles are guided into the concentric circle or groove, and the paddles thereby withdrawn; by putting them back again to the point *f, f,* the paddles are thrown out beyond the circumference of the wheel, into the excentric part of the groove, and consequently protruded. Another method may be suggested to effect this purpose,—which is, to construct the side or groove-plates in such a manner, that they can be moved up and down; which will, when they are moved upwards, necessarily take the paddles with them.

The patentee claims the construction of a paddle-wheel, consisting of a hollow drum or solid cylinder, having recesses into which the paddles slide or fold in the manner above shewn and described, or any modification of the same. He also claims the employment of paddle-wheels, thus constructed, whether the same are either wholly or partially submerged, and placed in cases or hollow trunks, open at the bottom or sides of the vessel for the free admission of water; such wheels being so arranged, that their paddles shall protrude beyond their peripheries in that part of their circumference which is outside of the casing or trunk, and be withdrawn within the cylinder or drum in the parts that are within the casing. And lastly, he claims the drawing in of all the paddles, by means of concentric grooves and switches, in the manner described, so that the paddles may cause no obstruction to the sailing of the ship.—[*Inrolled in the Petty Bag Office, December*, 1843.]

Specification drawn by Messrs. Newton and Son.

To THOMAS CLARK, *of Wolverhampton, in the county of Stafford, iron-founder, for an improved domestic convenience.*—[Sealed 26th September, 1844.]

IN Plate XI., fig. 1, is an elevation of the improved domestic convenience, and fig. 2, is a transverse vertical section, taken on the line 1, 2, of fig. 1; fig. 3, is an edge view of the cover, and fig. 4, is a transverse vertical section of the same. *a*, is the body of the vessel, formed of metal, and coated on its inner side with enamel or other suitable matter for resisting the action of liquids or moisture; *b*, the handle; *c*, an enlarged or dished portion of the upper edge of the body of the vessel, which receives the cover *d*, somewhat resembling a shallow dish. *e*, is a balanced lever-valve, of which *f*, is its fulcrum, *g*, its closing or acting-plate, and *h*, its counterbalance weight; this valve closes the central aperture *i*, in the cover *d*, through which the waste water passes, or is poured into the vessel *a*. The adjustment of the counterbalance weight *h*, is such, that the valve opens with the pressure of the stream of water poured into the cover *d*, and closes immediately on its cessation. The cover is attached to the body of the vessel by two hooks *j*, on its edge, which catch hold of two pins *k*, on the ears *l*, (that hold the handle of the vessel), and form therewith a bayonet joint or fastening, as shewn more clearly in the detached view, fig. 5. The escape of offensive effluvia from the contents of the vessel *a*, is prevented by the valve *e*, being made to fit accurately to its seat, and by the thin film or stratum of water which will generally remain upon the upper surface of the valve-plate. The lid *d*, is caused to fit air-tight, by a facing of cloth, caoutchouc, or other suitable material, attached thereto, or to the sloping rim *c*, of the vessel, or to both the lid and the rim *c*.

The patentee claims, as his invention, "the specific constructions and arrangement of parts, and the combination thereof in the compound produced, as they are hereinbefore specially set down and described."—[*Inrolled in the Rolls Chapel Office, March*, 1845.]

To Thomas Noton, *of Deanston Works, Deanston, in the county of Perth, Scotland, manager of cotton works, for improvements in power looms, for the manufacture of cloth from cotton, wool, and other fibrous substances.*—[Sealed 21st January, 1845.]

This invention consists in taking up the cloth, and winding it upon the cloth-beam of power looms, by means of a pair of parallel plates or discs, at the end of the beam, which discs act by friction to produce the rotation of the cloth beam.

In Plate XII., fig. 1, is a side view, and fig. 2, a partial front elevation of a power loom, with this improvement applied thereto. *a*, is a ratchet-wheel, which is put in action, in the usual manner, by a lever connected with the swords *j*, of the lay, and is furnished with a suitable catch or pall to prevent it from moving backwards. On the same spindle as the ratchet-wheel *a*, is a spur-wheel *b*, gearing into a second spur-wheel *c*, on the spindle of which a third spur-wheel *d*, is fixed, and gears into a wheel *e*, upon the spindle of the emery-roller *l*; this wheel *e*, gears into another wheel *f*, upon the socket *m*, through which the spindle of the cloth-beam *n*, works. *g, h*, are two friction-plates, one of which, *g*, is fixed on the socket *m*, and the other, *h*, upon the spindle of the cloth-beam. *i, i*, are nuts, screwed upon the extremity of the spindle of the cloth-beam, and are intended to press the friction-plates together; the cloth-beam thus receives its motion, and takes up the cloth as fast as it is delivered from the emery-roller *l*; and the required tension is given to the cloth during the operation of weaving.

The patentee claims the mode of winding on the cloth upon the cloth-beam *n*, in power looms, by the application and use of friction-plates or discs, as above described and set forth.—[*Inrolled in the Rolls Chapel Office, March*, 1845.]

To WILLIAM HENRY RITCHIE, *of Lincoln's Inn, in the county of Middlesex, gent., for improvements in obtaining copper from ores,—being a communication.*—[Sealed 10th October, 1844.]

THIS invention relates to the employment of galvanic currents for precipitating copper from solutions of sulphate of copper, obtained by dissolving copper ores. In previous attempts to effect this object, the exciting liquid and the solution of copper have been kept separate; but, in the present instance, the exciting liquid is in contact with the solution of copper. Another improvement consists in the application of cast-iron for receiving the precipitated copper; though, when using other parts of the invention, other metal surfaces may be employed, and these surfaces the inventor calls the "generating surfaces." Another part of this invention consists in combining sulphate of iron or zinc with copper ores, when they are being calcined or roasted.

The ores are mixed with as much sulphate of iron or zinc, in the state of crystals, as will be equal to one-fifth of the quantity of sulphate of copper contained in them; they are then calcined in the ordinary manner, and are afterwards dissolved; the solution is then put into any suitable vessel, and on the top of it is placed a solution of sulphate of iron, for the exciting solution, as shewn in Plate XII., wherein *a*, is the vessel, *b,* the solution of the ores, and *c,* the exciting solution. A cast-iron plate or "generating surface," *d,* and a "conducting surface" or plate of lead, or other suitable metal, *e,* are now introduced, and being suspended from a rod of copper, or other suitable material, *f,* the copper in the solution becomes deposited on the leaden plate: as many pairs of cast-iron and leaden-plates may be used as the vessel *a,* will contain.

Owing to the difference in their specific gravity, the solution of sulphate of copper will be at the lower part of the vessel *a,* and the solution of sulphate of iron at the upper part, and they will remain in contact without mixing. In the course of working, the solution of sulphate of copper will become lighter at the upper part than lower down, and should be drawn off when it has lost about half its copper; the solution of sulphate of iron, which is made by mixing two parts of water with one part of a saturated solution, becomes heavier at the lower part than at the upper, and should be drawn off when it is as dense as the weak solution of sulphate of copper that is being drawn off. To keep up a constant equilibrium in the liquids, an outlet *g,* is applied to the vessel *a,* so that the solution of sulphate of copper may flow off at the upper part, whilst an equal quantity is entering at the inlet *h*; and there is an outlet *i,* for carrying off the solution of sulphate of iron, at the lower part of that liquid, whilst a corresponding quantity is admitted into the vessel *a,* at the inlet *j*: the sulphate of iron, thus drawn off, may be crystallized, and used in the process of calcining the ores.

The patentee claims, Firstly,—combining with the roasting of ores, sulphate of iron or zinc. Secondly,—the mode, herein described, of manufacturing copper, by using the exciting liquid in contact with the solution of copper. Thirdly,—the use of cast-iron for what he terms the generating surfaces. Fourthly,—the use of sulphate of iron as the exciting liquid, when using galvanic currents to precipitate copper.—[*Inrolled in the Inrolment Office, April,* 1845.]

To **William Birkmyre,** *of Millbrook, in the county of Cornwall, chemist, for certain improvements in the manufacture of potash and soda-alums, sulphuric acid, and sulphate of soda.*—[Sealed 19th September, 1844.]

These improvements consist, firstly,—in the application of a substance to prolong the disengagement of the oxides of nitrogen from the nitre-pot, in sulphur furnaces or pyrites kilns (employed in the manufacture of sulphuric acid); and which substance will also serve to produce potash or soda-alum. Secondly,—in decomposing substances containing potash and alumina, or soda and alumina, by the action of heat and sulphuric acid,—or of heat, sulphuric acid, and a salt of potash or soda,—for the purpose of forming a salt of alumina, in vessels contained within sulphur furnaces or pyrites kilns, and condensing the volatilized sulphuric acid in vitriol chambers. Thirdly,—in producing sulphate of soda, by decomposing a solution of soda-alum by a salt of potash, into potash-alum and sulphate of soda.

The patentee proposes to use clay, particularly porcelain or Cornish clay, to prevent the too rapid disengagement of the oxides of nitrogen from the nitrate of potash or soda in the nitre-pot, and to produce, at the same time, either potash-sulphate of alumina (potash-alum), by the decomposition of nitrate of potash, or soda-sulphate of alumina (soda-alum), by the decomposition of nitrate of soda. The mode of carrying out the invention is as follows:—1,600 lbs. of dry Cornish clay, in powder, are to be mixed with 1 ton of powdered crystals of nitrate of potash; then, for a vitriol chamber, making 1½ tons of sulphuric acid, sp. gr. 1·848, *per diem*, take, every two hours, 18 lbs. of this mixture, and put it into a nitre-pot, and, after stirring in 14 lbs. of sulphuric acid, sp. gr. 1·750, place the pot a few inches above the burning sulphur of a pyrites kiln. By the action of the heat and sulphuric acid, the oxides of nitrogen begin gradually to escape into the chamber; and the mixture, which becomes converted into a species of burnt alum, should be withdrawn from the kiln at the end of four hours. The product in the nitre-pot will generally weigh 22 lbs. and yield, on lixiviating with 10 per cent. of sulphuric acid, as much potash-alum as will be equal to two and a half times the weight of the nitrate of potash employed, or fully half the quantity that can be extracted.

The above process admits of variety in its application; for instance, if 10½ lbs. of nitrate of potash were used with 15 lbs. of Cornish clay and 20¼ lbs. of sulphuric acid, sp. gr. 1·750, the whole of the potash might be converted into potash-alum; but the patentee prefers resorting to the following operation, to convert the whole of the potash into potash-alum:—Put 25 lbs. of powdered Cornish clay into a large nitre pot, and then stir in 37 lbs. of sulphuric acid, sp. gr. 1·750; place the pot above the burning sulphur of a pyrites kiln, and at the end of four hours withdraw it,—or, instead of 37 lbs. of sulphuric acid, sp. gr. 1·750, 60 lbs. of sulphuric acid, sp. gr. 1·400, may be used. The product resulting from the weaker acid is nearly the same as that from the stronger acid, with the advantage of rendering the use of steam in the chamber unnecessary; the greater part of the acid, in both cases, combines with the alumina and potash or soda of the clay, forming chiefly a sesquisulphate of alumina. Of the substance thus prepared, 168 lbs. are to be mixed with 336 lbs. of the product from the nitrate of potash and clay, and the mixture lixiviated with 67 lbs. of sulphuric acid, sp. gr. 1·400, in a leaden vessel, placed over the flue of the reverberatory furnace used for making alkali. In six or eight hours, the lixiviation will be complete, and the solution should then be run off, at 36° Twaddle, into a leaden settling cistern, placed in a hot chamber, in order to settle the silica of the clay, and prevent the crystallization of the alum. After settling, the clear liquor may be pumped into the ordinary boilers for concentration.

Soda-alum and sulphate of soda are manufactured by the patentee in the following manner:—1 ton of nitrate of soda is to be mixed with 2,000 lbs. of powdered Cornish clay; then, for a vitriol chamber making 1½ tons of sulphuric acid, sp. gr. 1·848, *per diem*, take, every two hours, 17 lbs. of this mixture, and put it into a nitre-pot, stirring therewith

20 lbs. of sulphuric acid, sp. gr. 1·750; then place the pot above the burning sulphur of a pyrites kiln, and at the end of four hours withdraw it therefrom. 500 lbs. of this product are to be lixiviated with 67 lbs. of sulphuric acid, sp. gr. 1·400, in a leaden vessel, and at the expiration of six or eight hours, the solution is to be conveyed into a settling-cistern, placed in the open air. The clear liquor from the settling-cistern may be concentrated for soda-alum; or it may be decomposed, by 250 lbs. of acid sulphate of potash, into potash-alum and acid sulphate of soda. The latter should be transferred to a reverberatory furnace, and there converted into sulphate of soda, by the addition of 75 lbs. of common salt for every 300 imperial gallons of the solution of acid sulphate of soda, at 30° Twaddle.

Instead of Cornish clay, other clays, or albite, or felspar, may be used.

The patentee claims, as his invention, the forming a compound of sulphuric acid with the alumina potash or soda of clays, albite, or felspar, either by the action of heat and sulphuric acid alone, or combined with a salt of potash or soda, in vessels contained within sulphur burners or kilns, used in the process of manufacturing sulphuric acid.—[*Inrolled in the Inrolment Office, March,* 1845.]

To Edward Guigues, *of Peckham, in the county of Surrey, Gent., for improvements in printing on leather and skins,—being a communication.*—[Sealed 17th October, 1844.]

The improvements in printing on leather and skins, which constitute this invention, are as follow:—The patentee takes goat, sheep, or other hides, tanned, by preference, with Sicilian sumach, and washes them in water, to remove all oily matter, and any sumach that they may contain. For one dozen skins, a pint of sulphuric acid, of 66° Baumé, and 12 gallons of water, heated to 90° Fahr., are put into a tub, and in this liquid the skins are immersed for ten minutes; they are then immersed in the same quantity of cold water for a quarter of an hour; after which they are placed upon a table, and by the process of "striking out," nearly all the water is extracted, and they are hung out to dry; when about half dry, the skins are laid, one above another, upon a table, and brushed smooth, in order that they may be more easily printed upon; and after remaining on the table for a day, they are ready for the printer.

The printing-table, and the accessaries, are the same as when printing on stuffs and other fabrics; but the modes of preparing the colors are different. The following solution is mixed with all the colors, to render them unalterable, and proof against acids:—Half a gallon of muriatic acid, of 81° Baumé, and a quarter of a gallon of aquafortis, of 36° Baumé, are introduced into a flat bottle with a long neck, termed a "matrass," which bottle is placed upon an oven, heated to 100° Fahr., and gradually raised to 150°; then 1 lb. of sal-ammoniac is cut very fine, and, every two minutes, 1 oz. of it is put into the bottle, until all is dissolved; then 1 lb. of granulated tin is divided into twenty equal parts, and one part is introduced into the bottle every ten minutes. As soon as the tin is perfectly dissolved, the bottle is taken off the oven, and the solution allowed to "fine" during two days; at the expiration of which, it is poured into a bottle, and kept tightly corked.

The colors are prepared in the following manner:—For red, 4 lbs. of Brazil chips are put into 4 gallons of soft water, and boiled for six hours; then the liquor is passed through a sieve, and allowed to remain for a month before being used: to every pint of this liquid color, one-fourth of a pint of the solution, above described, is added. Violet is made by substituting Campeachy chips for the Brazil chips; the color is ready for use immediately after straining; and the solution is added in the same proportion as to the red. Yellow is produced by using Persian berries; and the color is ready for use when cool. Other colors are prepared in like manner.

After the skin has been printed, and is perfectly dry, it is dipped into cold water, and then into water heated to 100° Fahr. (to which sulphuric acid has been added, in the proportion of 1 pint to 12 gallons of water); when the skin has remained in the latter for three minutes, it is withdrawn, and soaked in cold water for ten minutes; it is then laid upon a table, and the water extracted by the process of "striking out;" after which, the surface is smoothed over, by hand, with linseed oil, and the skin is hung up to dry; when dry, it may be polished in the ordinary manner.

The patentee claims "the mode of printing leather and skins, by the use of a preparation of the materials as herein described."—[*Inrolled in the Inrolment Office, April,* 1845.]

To George Onions, *of* 16, *High-street, Shoreditch, in the county of Middlesex, engineer, for improved wheels and rails for railway purposes.*—[Sealed 7th July, 1841.]

The patentee describes his improvements as follows:—

"My process for improving wheels for railway purposes consists in casting such wheels of iron, made from Cumberland or Lancashire ore; which are afterwards made malleable, by annealing; and are subsequently case-hardened. And I claim, as my proper and peculiar invention, the casting of such wheels of iron, made from Cumberland or Lancashire ore; the rendering the same malleable, by annealing; and the case-hardening of the same.

"And my improvement of rails for railing purposes consists of an arched base, manufactured of common cast-iron, with a groove running along the centre thereof; and into which groove a rail, made either of iron cast from Cumberland or Lancashire ore, and afterwards rendered malleable, by annealing, or made of wrought-iron, is affixed: the base of such rail I cast singly or doubly; if doubly, by means of connecting substances of iron. And I claim, as my proper and peculiar invention, as well the mode of construction of such single or double base, as of the casting of the rail of iron, cast from Cumberland or Lancashire ore, and afterwards rendered malleable, by annealing."—[*Inrolled in the Inrolment Office, January,* 1842.]

To Samuel Cunliffe Lister, *of Manningham, in the county of York, worsted spinner, for improvements in preparing and combing wool.*—[Sealed 27th September, 1844.]

The following is the concise manner in which the patentee has described his invention:—

"My improvement in preparing wool consists in passing wool through a screw-gill, before being combed; as I find it very beneficial in opening out the staples, and separating the fibres of wool, and, at the same time, obtaining an endless sliver, ready for filling on to the combs.

"My improvement in combing wool consists in causing the saddle-comb to recede at the time that the revolving combs are passing through the wool, and thereby relieving the strain upon the wool.

"I have not thought it necessary to shew drawings, as it is a matter of easy application to the machines now in use, and can be done in a variety of ways, that any mechanic, having the idea given, could easily apply."—[*Inrolled in the Inrolment Office, March,* 1845.]

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 212, Vol. XXVI.)

April 23rd, 1844.

The President in the Chair.

"On the causes of fracture of the Axles of Railway Carriages." By Joseph Glynn, M. Inst. C. E.

The author states, that twice during the year 1843, he was placed in situations of danger, from the breaking of a fore axle of a tender. On one occasion, the accident happened whilst the train was proceeding at upwards of 30 miles per hour, and every carriage was more or less injured.

The journal was 2¾ inches diameter, the part adjoining it, where the wheel was keyed upon, was 3¾ inches diameter, the body of the axle at the shoulder was 4¼ inches diameter, and 3⅝ inches diameter in the centre of its length. The gauge of the railway was 4 feet 8½ inches.

A short time before the accident, the tenders, which, when empty, weighed about 2¾ tons, had been supplied with coke and water. The tank held 1000 gallons; and about 20 cwt. of coke had been received; very little of either had been expended at the time of the fracture of the axle. The total weight of the tender and its load was about 8¼ tons, on four wheels of 3 feet 6 inches diameter.

Both the fractures presented the same appearance; for about ½-inch in depth all round, there was a perfectly smooth cleft of a blue and purple colour; this annular cleaving appeared to have been produced by a constant process; the central crystallized part being gradually reduced in diameter, until it was barely able to sustain the weight, and it broke on being exposed to a sudden strain.

The author suggests, that the smooth blue and purple cleft is produced, by the alternate rupture and compression of the particles or fibres of the iron.

It is observed, that the fracture commences at the end of the key groove, which is about ¼-inch from the shoulder, against which the wheel is fixed.

The author is of opinion, that the breaking action commences with the first journey of the tender, and that the axles continually receive such injury as they would, if they were laid over the edge of an anvil, and received a constant succession of smart blows from a hammer at the end,—the axle being constantly turned round.

In addition to this percussive action, a powerful break is usually applied upon one end of the axle, while the wheel at the other extremity slides along the rails, tending to produce a tortional effect; it is generally noticed, that the fractures occur at the ends of the axles, where the breaks are applied.

It would appear, that the axles of the tenders are more frequently broken than those of the other carriages; they carry heavy loads; very frequently make more journeys than either the carriages or the locomotives; and the break is applied upon their wheels at every station, although it may not be necessary to use it upon the passenger carriages.

The nave of the wheel, the groove cut for the key, and the position of the shoulder, seem to point out the place where the fracture should commence.

The author is of opinion, that the diameter of the axles should be increased where the wheels are hung, so that being greater in diameter than the body of the axle, by the depth of the key-groove, the mass would not be rendered weaker, by the cutting out of the groove.

He recommends also, that the breaks should be applied simultaneously upon the wheels at both ends of the axles; and he observes that there is probably a certain limit, in point of time, to the durability of all axles which are subject to such action; and that in many instances of the breaking of axles, the point of fracture is concealed, unless the wheels are taken off for the purpose of examination, which, he suggests, should in all cases be done.

The paper is accompanied by a drawing, shewing the appearance of the broken axle.

"Account of the Scaffolding used in erecting the 'Nelson Column,' Trafalgar-square." By Thomas Grissell, Assoc. Inst. C. E.

In adopting the principle of timber scaffolding for buildings, in preference to poles and ropes, Messrs. Grissell and Peto, the contractors, were influenced by considerations of saving both time and expense. They had long been impressed with the want of scientific principle, exhibited in the ordinary scaffolding, and were more readily induced to turn their attention to that now referred to, which they believe to be an essential improvement, and calculated to be of considerable advantage to contractors on large works.

The author is well aware of the progress which has recently been made by the civil engineers and architects of this country, but he ventures to claim some share of merit for the practical builders, to whom is committed the execution of the works designed by the engineer and the architect; and when a review is taken of the stupendous public works which have been executed within the last few years, it is evident, that without the exercise of great skill and the introduction of new modes of reducing labour, the amount of work could not have been executed within the time.

The necessity for this reduction of labour on large works had been long felt in the north, and methods had been adopted in consequence, to emulate which, this timber scaffolding was introduced to London. The system had been employed, in rather a rude form, by Mr. Tomkinson of Liverpool, in his quarries and stone yards, for moving stones of large dimensions. Scaffolding of a somewhat similar kind was used in the erection of the Arc de Triomphe, Barrière de l'Etoile, and at the Eglise de la Madeleine, at Paris.

The first time it was used by the author's firm, was for the erection of the Reform Club House (Pall Mall), under Mr. Barry, in 1838; then at the large graving-dock at Her Majesty's Dockyard, Woolwich, under Mr. Walker (Pres. Inst. C.E.) in 1839, and it is now employed very extensively at the new Houses of Parliament. In these constructions its general applicability was proved; and in the erection of the Nelson Column (commenced in 1840), where it was carried up to the height of 180 feet, its stability at a considerable elevation was fully tested. Its usefulness is manifested, by the facilities which it affords to the workmen, particularly in buildings of stone. By its aid, and with the travelling machine at its summit, one mason or 'setter,' can set as much work in one day, as was formerly done in three days; whilst at least six labourers are dispensed with, who, with the old mode of scaffolding, were always required to be in attendance. It is also well known, that scaffolding poles and cords are not only expensive, but are subject to rapid decay, and after a few years' wear become useless; in fact, the scaffolding of a moderately extensive building costs a large sum when first purchased, but it is almost valueless after a comparatively short period of time. Such is not the case with the timber scaffolding, which may be said to be of no greater cost to the contractor, than the expense of its erection, which will not exceed in any ordinary case threepence per foot cube. It is not secured together by either bolts or spikes, so that the waste is trifling, and after having performed its duty as a scaffold, it may be removed piecemeal into the building, at the level of each floor, and be used directly for constructing the roof and the internal carpentry of the structure. The timber, having become seasoned by its exposure to the weather, is consequently better fitted for immediate use.

These advantages have been proved in the buildings which have been mentioned, and after an experience of more than five years, the author strongly recommends the adoption of the system. He also advises its use in moving and working large stones, either for permanent erections, or in masons' yards. If used on a wharf, the rent would soon be saved in labour, and by allowing the stage to project 8 feet or 10 feet over the river, the scaffolding would be found to answer the purpose of a crane.

The scaffolding at the Nelson Column, designed by Mr. Allen, under whose direction the work was executed; was composed of sills, uprights, cross-heads, longitudinal timbers, braces, and struts, which were used whole, without sawing; the upright timbers were slightly tenoned into the horizontal timbers, and the junctions were secured by iron dogs, driven into the timbers diagonally across the joints. This mode was preferred to bolts or spikes, on account of the ease with which they could be withdrawn, and because the timber was not injured. The base of the scaffold was 96 feet square, exclusive of the racking-braces; the height of each stage varied from 48 feet to 21 feet, upwards; and the total height was about 180 feet. The total amount of timber in the scaffold was 154 loads, or 7700 cubic feet, and the cost of its erection was £240.

Its stability was secured, at the height to which it was carried, by using flying wind-braces, supported upon cross transoms, running outwards about 6 feet beyond the perpendicular of the scaffold at each stage.

The paper is accompanied by a handsome model of the Nelson Column, surrounded by the scaffolding, on a scale sufficiently large to be worked from.

Mr. Nicholson remarked, that a scaffolding of a similar description was used in 1837 by Messrs. Cubitt, (Gray's-inn Road), for erecting the entrance gateway of the London and Birmingham Railway (Euston Square). It was composed of two parallel rows of whole timber uprights, 50 feet high and 17 feet apart, surrounding the building; these were well stayed by diagonal braces, and a tram-way was formed on the top of each row, by horizontal sill-pieces, bolted down and secured by plates. The building work was executed by the aid of travelling carriages upon the tram-ways, and when the masonary had reached the height of the first scaffold, a second series of uprights and sills was added, making the total height 90 feet, which enabled the work to be completed without an accident.

Mr. Harrison believed, that a scaffolding of a somewhat similar construction was used by Messrs. Rennie, at the Victualling-yard at Plymouth, in 1826.

Mr. Rennie said, that the scaffolding employed for raising the statue and other heavy parts of the work, at the Victualling-yard, was on the derrick principle, and was somewhat similar to that used for erecting the Commemoration Column at Devonport.

Mr. Grissell stated, that when writing the account of the scaffolding at the Nelson Column, that which had been used by Messrs. Cubitt, at the entrance of the London and Birmingham Railway, had entirely escaped his recollection; he now remembered it perfectly, and was happy to have the opportunity of acknowledging that fact. He could not speak too highly in praise of the system, and he thought its advantages had, as yet, been underrated. The waste of timber was comparatively nothing; while serving as scaffolding it was becoming seasoned, and like that at the Nelson Column, could be immediately worked up, in situations demanding dry timber. The cost was one-half, and sometimes one-third, of the ordinary kind of scaffold, if the loss by the rotting and destruction of poles and cords was taken into account. The saving of labour in raising the material was very great, particularly where weights of from 8 tons to 14 tons required to be lifted. If steam power had been used at the Nelson Column, a still greater saving would have been effected.

Another considerable advantage was the freedom from danger to workmen; during five years, in all the works where he had used this kind of scaffolding, only one man had been killed. That accident occurred at the Woolwich Graving Dock, when a man was thrown from the travelling carriage, by the handle of the winch striking him, from his having omitted to put on the break.

He believed, that this description of scaffolding, might be safely carried still higher than at the Nelson Column, for although before the statue was hoisted, he had felt somewhat anxious, and had thought of attaching guide chains, and using other precautions, the fabric had stood so well, that he should not now hesitate to go to a greater height, relying upon the scaffolding alone.

Mr. Smith had adopted the system of the travelling winch on a framing, with great advantage in his carving-room, for moving the heavy blocks of stone, from which the capitals of the columns for the Royal Exchange were cut. Without such mechanical assistance, he could never have executed his task, within the required time, nor could the capitals have been raised and placed on the carriages, to be conveyed away, without much danger or injury.

Mr. Giles said, that Corby Bridge, over the Eden, on the line of the Newcastle and Carlisle Railway, was built by Mr. Denton, the contractor, by means of whole timber scaffolding put together in three stages. The bridge consisted of five arches, of 80 feet span each, 100 feet in height, and contained 400,000 feet of stone-work, which was executed with the greatest facility, chiefly owing to the convenience afforded by the scaffolding, and without any accident, excepting to the foreman, who fell twice from a considerable height, but fortunately was not killed.

Mr. Fowler said, that the scaffolding at the Cathedral at Cologne, was of whole timber; there was little doubt, that the system was very similar to that which was employed when the building was commenced in 1248. The crane which was used in raising the materials, still remained on the summit of one of the towers; it was once removed, but was speedily restored to its situation, as the superstitious fears of the inhabitants of Cologne were excited by the occurrence of a storm, immediately consequent upon the removal of the crane. It had subsequently been constantly repaired as it decayed, so that at present little of the original remained, but the form was still the same.

Mr. Fowler believed, that the materials for the York Column (Carlton Terrace) were raised by a kind of travelling carriage, on the top of the scaffolding.

Mr. Hawkins observed, that the scaffolds used at Vienna, for the erection of any building of importance, were always constructed of whole timbers, secured together by 'dogs.' In 1827 he superintended the erection of an extensive sugar-house at Vienna, where such scaffolding was used.

Mr. Coldhurst stated, that at Devonport there was a column built of granite from Holman's Hill Quarry, near the Tamar. The shaft was 11 feet in diameter; its height, from the bottom of the shaft to the top of the capital, was 65 feet 4 inches. The total height of the column, with its inferior and crowning pedestals, was 101 feet 4 inches. Its height above the street, including the rock on which it stood, was 124 feet. The abacus of the capital was composed of four stones, each weighing between 3 and 4 tons.

The stones of the column were raised and set, entirely without the use of scaffolding, by means of a series of tall spars joined together; the lowest being fixed into the ground and braced by diagonal pieces, was lashed and strutted to the lower part of the shaft. A gaff, with a jaw at the lower end, was then slung in the throat by a strong rope or chain, so as to work round the upright spar, in the jaw prepared for this movement; from the end of the gaff, blocks and a fall were suspended, in such a manner as to command every part of the work, by raising or depressing the point of the gaff, to increase or diminish its range. Crab winches sufficed to raise the stones; and it was stated that the work was executed in a very short time.

Mr. Rendel had seen this column while in course of construction; the derrick appeared to act well, and it was certainly a cheap mode of raising the materials.

Mr. Smith said, that in a recent visit to Liverpool, he had observed an ingenious mode, adopted by Mr. Tomkinson, for raising building materials, which almost superseded the use of external scaffolding. It consisted of a very high double 'derrick,' placed upon wheels running on a tram-way, laid parallel with the walls of the building; the head of the derrick curved over towards the wall, and steam was employed for raising the materials, which appeared to be accomplished with rapidity.

The President remarked, that the Institution always viewed with pleasure, papers descriptive of the methods adopted by contractors, in the execution of works designed by Civil Engineers or Architects. The profession was much indebted to the practical skill and intelligence of the contractors, and it would be extremely interesting, to find recorded in the Minutes of Proceedings of the Institution, the names of the inventors, and the dates of the introduction of such ingenious modes of accomplishing works of magnitude, as had been described by Messrs. Grissell and Peto. This could only be arrived at by, either the engineers or the contractors sending the necessary information, or by their giving it during discussions at the meetings.

General Pasley described the method adopted by Mr. T. Slacks (Langholm), for building the obelisk which was erected on the Whitaw, Eskdale, to the memory of the late Major-General Sir John Malcolm, a native of that district.

The obelisk, which was of white sand-stone, was carried up to the height of 100 feet above the foundation; it was built hollow, with thorough courses at intervals; through the centre of each of these courses was left a circular hole. In the lower of these holes, was placed the foot of a pole 40 feet long, and 10 inches diameter; the next hole above served as a stay, whilst the upper one supported the whole weight, as around the pole was firmly fixed a collar of hard wood. Beneath this collar 17 metal balls, 3½ inches in diameter, were introduced, which, running in corresponding circular grooves in the collar and the thorough course, enabled the pole to revolve easily. Across the top of the pole was mortised a beam 12 feet long and 12 inches square, in the form of the letter T, and it was strengthened by diagonal iron braces and straps. By means of a crab-winch, with a rope passing over pulleys in each end of the transverse beam, the stones were raised to the requisite height, and by a transversing carriage on the beam, a small crab and pulleys, the stone was enabled to run inwards to the spot for laying it. The crane was raised as each bond or thorough course was fixed, and the time consumed in the operation of moving it did not exceed two hours.

This crane had been found very efficient, and had greatly reduced the cost of building the obelisk, which was completed in less than twelve months. For the ingenuity displayed in this simple modification of the balance-crane used by Mr. Stevenson, at the Bell Rock Lighthouse, and for a clever hanging scaffolding used for completing the pyramidal top of the obelisk, the Gold Isis Medal was voted to Mr. Slack, by the Society of Arts, in 1836-7.

A model was exhibited, of a moveable derrick crane which had been presented by Mr. Howkins. It was used by Mr. Wightman, at the works of the Granton Pier, Edinburgh, and was stated by him to be very superior to any other kind of crane. It consisted of a vertical post, supported by two timber back-stays, and a long moveable jib, or derrick, which was hinged against the post, below the gearing; this jib was held by a chain, passing from a barrel over a pulley at the top of the post, in such a manner that the extreme end of the jib could be raised almost vertically, or be lowered nearly to a horizontal position.

The chief advantage it possessed over the old jibbet crane, was, that it commanded concentric circles of from 10 feet to 60 feet radius, which was of great use in large works, as it could extend its sweep over a circle of 120 feet diameter, without being moved from its position; whereas, the old gibbet-crane commanded only one circle of comparatively limited extent, and in moving it, as the works proceeded, there was a considerable loss of time.

Mr. Bremner stated, that he had seen the crane at Granton Pier; it was a very useful machine, and the only fault he could find with it, was, that in an exposed situation, there was a risk of the wheel-work being destroyed. He believed, that the contractors had found much advantage from its use.

Mr. Bremner had used, at the works of the Lossiemouth Harbour, a crane of somewhat similar description. The jib was composed of two spars, with the hoisting-chain working between them; the radius of its sweep was 60 feet,—so that any spot, within a circle of 120 feet in diameter, was fully commanded by it, and that extent of work could be completed without moving the crane.

Mr. Gale presented two drawings of improved moveable jib cranes, the alterations in which, had been suggested by the serious accidents which had occurred from the failure of the ordinary cranes.

On investigating the circumstances connected with these accidents, he found, that in general they had arisen from the snapping of the jib-chain. After numerous experiments it occurred to him, that this defect might be obviated, by attaching the jib-chain to the top of the post, instead of fixing it to the end of the jib; this alteration was productive of great advantage, the strain was found to be less than one-half that of the single jib crane, and it consequently required fewer men to work it.

He had also applied a rope instead of a chain for working the jib, as it was preferred by some builders, and he had also made some minor improvements in the other parts of the cranes.

These kind of cranes were, he believed, introduced by Mr. W. York, at Glasgow, in the year 1833, and Mr. Gale had used the improved sort in 1842, at the erection of the New Court Houses, Glasgow. Since that time many builders had adopted them, and their advantages were becoming daily so evident that he would send, early in the ensuing session, a paper descriptive of them.

Mr. Thomson believed, that cranes of this description were first used at Glasgow, by builders. The contractor for the Grangemouth Docks, under Sir John Macneil, employed them in 1841 and 1842, with much advantage; he thought them the most useful kind of cranes for general work.

The President agreed in the opinion of the general utility of the cranes; he had been so pleased with them, that he requested Mr. Howkins to present to the Institution the model of that used at Granton Pier. With respect to the date of the introduction of the swinging-jib, or moveable derrick crane, it was used at Granton Pier by Messrs. Orrell of Liverpool, in 1838, and he believed, that it had been commonly used by them for some time previously.

Mr. Wicksteed presented a drawing of the tackle used in elevating the pipes of the 'stand-pipe' of the East London Water-works. A piece of timber 9 inches square, was attached vertically to the upper flanch of the pipe, and held below by an iron girdle which encircled the body of the pipe; guy ropes were attached to the top of the upright, which served as the points of suspension for the snatch blocks, through which were passed the fall ropes from the large and the small crab winches. The iron girdle had at its opposite side, two pivots, which traversed the lower end of two timber jibs connected at the upper ends by a cross-piece, from the centre of which were suspended the blocks and tackle connected with the large crab, by which the pipes were raised. When each pipe had arrived at its height, the jib frame was drawn up vertically by the tackle from the small crab, and the pipe was lowered to its position; the pins were put into the flanches, and the whole apparatus was raised and attached to it, in order to use it for raising the next pipe. This process was repeated, until the stand-pipe was finished at a height of upwards of 130 feet. It was stated to be a very simple and economical mode of proeeding.

Scientific Adjudication.

VICE CHANCELLOR'S COURT.

Feb. 21*st,* 1845.

DIRKCS *v.* MELLOR AND ANOTHER.

THIS was a bill, filed by Henry Dircks, of 77, King William-street, in the city of London, engineer, against George Mellor and Thomas Greenhalgh, of Fairfield-street, Manchester, joiners and builders, for an infringement of a patent, dated the 22nd June, 1839, granted to Charles Wye Williams, Esq., of Liverpool, "for certain improvements in boilers and furnaces, designed to economise fuel and heat," of which letters-patent the plaintiff, Mr. Dircks, is assignee.*

A notice of motion was served on the defendants, for an injunction to restrain them from making and constructing and using boilers and furnaces, designed to economise fuel and heat, at Manchester, in the county of Lancaster, or elsewhere in England and Wales, and the town of Berwick-upon-Tweed, and also in all the colonies and plantations abroad of Great Britain, according to the invention mentioned in the said bill; or in any-wise counterfeiting, imitating, or resembling the said invention, or making any addition thereto, or subtracting therefrom, for and during the remainder of the term of fourteen years, granted by such letters-patent.

On the 24th April, 1845, the motion was opened by Mr. Bethell, Q.C., before his Honor the Vice-Chancellor of England; when, the defendants, admitting the plaintiff's patent and the infringement, an order was pronounced for an injunction in the terms of the notice of the motion.—The defendants undertaking to accept a license from the plaintiff, and to pay £46 for the same; and also, to pay plaintiff his costs, to be taxed, as between solicitor and client.

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* For specification of this invention, see Vol. XV., C.S., p. 401.

COURT OF COMMON PLEAS, GUILDHALL,

Before Mr. Justice Erle,—Feb. 22, 1845.

ALLEN AND OTHERS *v.* RAWSON.

(Messrs. JARVIS, SHEE, and BUTT, for the plaintiffs,—Messrs. HILL, CHANNEL, and WEBSTER, for the defendant.)

THIS was an action brought by the Felted Cloth Company against Mr. Rawson, a manufacturer at Leeds, on the plea of infringing a patent, granted 14th February, 1840, to Thomas Robinson Williams, for "certain improvements in the manufacture of woollen and other fabrics, or fabrics of which wool or furs form a principal component part; and in the machinery employed for effecting that object;" which patent has now become the property of the said company. (For the specification of this invention see Vol. XXII., p. 1, of our Journal, Conjoined Series.)

Mr. Jarvis, in stating the plaintiff's case, described the invention to be one of very considerable importance, and upon which large sums of money had been expended, in bringing it to perfection, and introducing it to public use; the result of which has been a return of very considerable profit to the plaintiff and his partners. The invention is a mode of producing long pieces or "commercial ends" of cloth, by a process of felting wool and other material into cloth, without the intervention of the processes of spinning and weaving, as heretofore practised.

It has been, for some years, a desirable object (said the learned counsel) to apply the process of felting to the manufacture of commercial ends of cloth, consisting of 22 yards or more; that process having been only carried out previously in the production of small pieces of felted fabric, suitable for making hats and other things; but the improvements introduced under the plaintiff's patent, enabled him to make very considerable lengths of felted fabric, and bring them into the market as commercial ends of cloth, for clothing and other purposes, which had never before been done. The means by which this was now attained, was, by receiving, from a carding or scribbling-engine, the prepared fibres, in the form of long sheets of sliver, and by lapping many of these sheets of sliver one upon another, so as to produce a mass or bat of the material in one continuous sheet, capable of being hardened and felted into a length of compact cloth, without joints or seams. In the former mode of producing felts, the sliver was taken and lapped upon a roller of about two feet diameter, and cut off from the periphery in lengths of about six feet; by which method, it would be perceived, lengths of 22 yards, or commercial ends of cloth, could not be obtained, without connecting the ends of such pieces together, and thereby making visible joints and ribs in the fabric, which would render it unsaleable. The first object, therefore, of the inventor, was, to construct such a machine as would enable him to place the slivers one upon another in very extended lengths, in order that there might be no joints or unequal lappings of the fibres throughout the whole extent of 22 yards, or more. Accordingly, the first machine, described under this patent, had a provision, by which the sliver was carried out to the desired length in one sheet; and when that was done, a second sheet of sliver, in like manner, was carried out and laid upon the former; and so on, with as many sheets of sliver as might be required for producing the required thickness or substance of the bat. This was effected by receiving the sheet of sliver from the doffer of the carding or scribbling-engine on to an endless travelling apron (like a jack-towel), which, as it passed round, was caused to receive and successively lap one sheet of sliver upon another, until the required thickness was obtained.

When this had been done, it was necessary to harden the sheet of combined sliver (or, as it would be now called, the bat), which was effected by means of pressure, moisture, and friction; but this operation was not considered to be new, as it had been employed before, for making hat-bodies and other felted articles of coarse material, and of a small size. It would, however, have been impracticable to adapt the same means to the hardening and felting of the sliver of fine wool, for commercial lengths of cloth, as had been employed for small pieces of coarse wool or hair, as the friction required would have produced inequalities in the substance of the cloth, and, of course, rendered it unfit for clothing. In order, therefore, to protect the bat, and prevent the displacement of the several thicknesses of sliver, the patentee adopted a means of carrying the bat forward between the hardening-rollers, by placing it between two endless travelling aprons. The second feature of the invention, therefore, is, not the mere operation of friction-rollers acting upon the bat to felt its fibres together, but the mode of conducting it through the hardening and felting machines, by means of the double aprons. The patent, therefore, being granted for the use of the endless travelling aprons, which is the material feature said to be infringed, it was not thought necessary, by the learned counsel, to go into all the other details of the specification, as enough had been said to convey to the minds of the jury the importance of this part of the invention, which the witnesses would prove had been piratically used by the defendant.

The learned counsel then expatiated upon the great length of time, labour, and expense, which had been bestowed upon this invention, for the purpose of perfecting it, and bringing the produce satisfactorily into the market, as an important article of trade: viz., commercial ends of cloth, obtained by the process of felting fibrous materials, without spinning and weaving. He then proceeded to state, that negociations had been carried on between the patentee and a relative of the defendant's, for renting a mill, at Leeds, and respecting the importance and general approval of the invention, which shewed the defendant's opinion of it. The mill was ultimately taken by the plaintiff and his partners, by the advice and at the recommendation of the defendant, and a very large establishment was put into operation in the said mill, at Leeds; subsequently, however, (from some cause which it was not necessary to explain) Mr. Rawson, the defendant, separated his interest from that of the plaintiff's, and thought proper to start a rival establishment; but not being bold enough to adopt precisely the same plans as those introduced by the patentee, he contrived an evasive imitation of the machinery, by which he hoped to obtain somewhat similar results.—It was these evasive schemes which had been adopted by the defendant, and carried into operation, to produce commercial ends of cloth by felting, that the plaintiffs considered to infringe on their patent-right.

Instead of the endless aprons proposed by the patentee (for conducting the sliver of carded wool out to an extent equal to 22 yards, or upwards, and lapping several sheets of sliver one upon another, by the rotary progress of the aprons), the defendant constructed a large drum, about 20 feet in diameter, and of the same width as the aprons, upon which he lapped the continuous sheet of sliver as many times as were necessary to produce the required thickness, and thereby obtained a length of bat equal to the circumference of the drum,—about 60 feet. Nor was this all,—for, seeing that the successive laps of sliver would not adhere to the drum, as it went round, but that they stretched, and fell in a baggy form at the under side, the defendant contrived to bind the several masses of sliver round the drum, by causing a series of yarns or threads to wind on with the sliver, so as to confine, by slight bands, each successive lap; and when, by the rotation of the drum, a sufficient thickness of sliver had been lapped round it, the bat was formed upon the surface of the drum, and confined by the bands, which, in effect, was tantamount to the travelling apron of the patentee.

The length of bat being thus produced, the next thing was to harden it; for this purpose, as before stated, the patentee conducted the bat between the hardening-rollers by means of two endless aprons, one supporting it below, the other covering and protecting it above: a mode never before known in the trade. The defendant has adopted the two aprons for the same purpose; and, as a colorable variation, has used, instead of rollers, the flat rubbing-board formerly employed for hardening hat-bodies. But the patentee does not claim the rollers in his present patent, he only claims the carrying-aprons; and the defendant has taken them for precisely the same purpose. Whatever doubt, therefore, might be raised against the large drum being an equivalent for the endless apron used in lapping the sliver, no sort of doubt can exist as to the conducting aprons, used in the hardening and felting, being identical, and the exclusive property of the plaintiff, applied as described, and for the uses stated.

The learned counsel then observed, that the defendant had, in accordance with a recent Act of Parliament, delivered a series of objections, which he makes to the plaintiff's patent, upon which he intended to ground his defence; these were as follow:—

1st. That the said Thomas Robinson Williams was not the true and first inventor of the said alleged invention, material parts thereof having been either published in the specifications of patents and otherwise, prior to the date of the said letters-patent in the pleadings mentioned, or in public use before the date of the said letters-patent in the pleadings mentioned. 2nd. That it is not stated in the said specification, nor can it be inferred therefrom, with sufficient, or any certainty, what is claimed to be new, and what is admitted to be old. 3rd. That the said Thomas Robinson Williams did not give therein the best information of which he was possessed. 4th. That the said invention, as to material parts thereof, is not any improvement in the manufacture of woollen and other fabrics, and in the machinery employed for such manufacture. 5th. That the specification and patent are inconsistent, and do not support each other.

Dated 15*th July*, 1844.

Upon hearing counsel on both sides, (17th July, 1844), Mr. JUSTICE MAULE issued the following order: *Allen* v. *Rawson*.— I do order that the defendant shall, within four weeks, deliver a further and better particular of his objections to the plaintiff's patent, in the following respects:—1st. Stating what are the material parts alleged to have been published. 2nd. In what specifications. 3rd. Strike out the statement that plaintiff did not, by his specification, describe and ascertain. 4th. State what sort of wool, fur, and hair, invention not applicable to. 5th. Strike out that the specification is calculated to mislead. 6th. Shewing in which respect the specification did not give the best information. 7th. In what particular the invention is not an improvement in the manufacture of woollen and other fabrics. 8th. Should shew how specification and patent are inconsistent.

In pursuance of the above order of Mr. Justice Maule, the following is the further and better particular of the defendant's objections to the patent of the plaintiffs,—the numbers of the amendments specified in the said first-mentioned order:—

First.—The making cloth by felting alone, without spinning and weaving.

Second.—The obtaining a bat of wool or other materials of any required length, width, or thickness, suitable to be made into commercial ends or pieces of cloth.

Third.—The producing pieces of cloth composed of felting substances, such as wool, fur, and the hair of animals, used either separately or mixed up together, and sometimes with a small addition of non-felting materials, such as cotton, silk, or flax.

Fourth.—The dispensing with oil, or oleaginous matter, in the manufacture of cloths.

Fifth.—The use of soap, or other saponaceous matter, in felting, instead of acids or acidulated waters.

Sixth.—The double or compound apron.

Seventh.—The extended sliver for forming a bat.

Eighth.—The use of travelling aprons.

Ninth.—The formation of continuous and extended slivers, and the felting such slivers.

Tenth.—The use of perforated steam-pipes to moisten and heat wool under manufacture.

Eleventh.—The method of felting without the use of the felting or hardening machine.

Twelfth.—The increasing the felting action, by causing the fibres of the fabric or cloth to be acted on in as many directions as possible.

Thirteenth.—The formation of a bat from an extended sliver, and its subsequent manufacture into cloth by felting, by suitable apparatus and machinery.

Fourteenth.—The method described, as shewn at fig. 18, of keeping the apron C, distended.

Fifteenth.—The winding a sliver from the carding-engine on rollers of large and small diameter, so as to form a bat, of any desired thickness, by the successive layers of material.

The specifications of the following letters-patent:—1*st.* Letters-patent granted to Joseph Booth, on or about the 23rd or 27th January, 1792, for England and Scotland respectively, for "a machine or apparatus, and certain chemical compositions for making various kinds of woollen cloths and other articles." 2*nd.* Letters-patent to James Bennett, 10th March, 1803, for "a method of felting woollen cloth, and also of felting cloth manufactured of sheep's wool and other combined materials." 3*rd.* Letters-patent, 3rd April, 1809, to Richard Wilcox, for "sundry apparatus or machinery for accelerating the manufacture of felts, &c." 4*th.* Letters-patent, 9th March, 1815, for England, and in 1821 for Scotland, to William Wood, for "the manufacture of a material or materials, and the application thereof to the more effectually making water-tight and sea-worthy ships, &c." 5*th.* Letters-patent, 4th April, 1838, to W. A. Robertson, for "certain improvements in the manufacture of hosiery, shawls, carpets, rugs, blankets, and other fabrics." 6*th.* Letters-patent, 22nd November, 1827, to William John Dowding, for "certain improvements in machinery for rolling or rollering wool from the carding-engine."

Sixteenth.—1*st.* In that the specification states, that the patentee prefers that the wool should be well scoured, whereas some kinds of wool will not felt at all if scoured. That if it was intended to represent to the public that it was immaterial or indifferent whether or no the wool to be felted was scoured, then the specification would mislead the public; and if it was intended to represent that some kinds of wool might be felted without being scoured, but other kinds of wool could not be felted without being scoured, the specification should have stated for what kinds of wool scouring was or was not requisite. *2nd.* In that the specification describes two feeding-rollers, placed at an angle with the feeding-apron, of somewhere near 45°. *3rd.* In that the specification does not state what descriptions of cloth should be milled in the common clothiers' fulling stocks.

Seventeenth.—*1st.* That commercial ends of cloth, made according to the specification, are inferior, as an article of commerce, to the fabrics made of the same materials by processes known and in use at the time of the patent. *2nd.* That the invention, described in the specification, is not any improvement in the article produced, and also in the machinery or arrangements for producing it. *3rd.* That the method of diagonal or cross-felting is not any improvement.

Eighteenth.—That the letters-patent are granted for certain improvements in the fabric produced, and in the machinery for producing the same; whereas the invention claimed by the specification is a new combination of machinery, apparatus, and proceedings.

The learned counsel said, it would not be necessary for him to comment upon the objections, until he had heard what his learned friends would say on behalf of the defendant and his plea: one thing he would say, that notwithstanding the several patents referred to, as having anticipated the plaintiff's invention, every attempt to affect the object of the plaintiff had failed; and though it might be said, that many have thought of the same object, yet he defied any one to shew that it had been successfully carried out, and the desired result produced, until the plaintiff, by his specification, clearly pointed out the way. For, until the plaintiff used the apron in forming the bat, and employed the apron for carrying the bat forward in the process of felting, that mode of operating was entirely new to the trade. It would not be necessary to read to the jury all the details of the specification; he would only, at present, point to the claims that close that document, which run thus:—"Having now fully described the whole process of making felted cloths by my improved machinery, I wish it to be understood, that I do not claim, as my present invention, any individual parts of the same; but I claim the adaptation of a double apron or aprons, or compound aprons, and rollers or cylinders, for the production of bats, as herein described, from the long sliver," [he claimed, therefore, the application of a double apron, as described, in combination with rollers or cylinders, for the production of bats, as therein described] "and the different means, herein described, for keeping these aprons, together with the bats, in a smooth and even condition; and I claim the extended sliver itself, as herein described, applied to forming a bat, by successive folds or layers, for the production of long or commercial ends of cloth without spinning or weaving:" [that is, when the bat is made, by the machinery, with aprons, for the purpose of making a commercial end of cloth, was the subject claimed] "I also claim the use of hardening machines," [which was not a subject of infringement] "in addition to steam-pipes," [which was unimportant] "and using travelling-aprons; I also claim the improved position of the rollers in the felting machine." [that was unimportant]. He also claimed the method of diagonal or cross-felting, and the use of soap instead of acids, which would be described by the witnesses; but that not having been infringed, he would not trouble them with it.

Respecting the matter which was the subject of infringement, the patentee says, "I claim the adaptation of the rollers,—I claim the extended sliver,—and I claim the use of a double apron in the felting-machine." There were various other claims which he admitted his learned friend had a right, in law, to object to—although they were not the subject of infringement—which his learned friend might enter on in evidence. His (the learned counsel's) object was not to enter on the subject matter in the first instance, but to explain the use of the patent he had described. The infringement was that which was a colorable evasion in the process of felting, in the manner described. Under these circumstances he would not trouble them longer with observations; the case would probably occupy some time in the course of evidence; and ultimately, perhaps, his learned friend would give him the opportunity of applying the evidence, at greater length, to the matter in issue.

Many witnesses were then called for the plaintiff, who described the machinery made by the patentee, and that employed by the defendant; and explained the models in Court, shewing how far they resembled each other in effect, although they might differ in appearance. The use of the alleged infringements were also proved; also matters of conference between the parties relative to the invention. The sufficiency of the specification was maintained, as fully explaining all the parts, so that a competent workman might carry out the invention in the way and by the means described. This having been carried to a great length, the plaintiff's case closed.

On the second day, Mr. Hill took an objection on the ground that the use of soap and water, or saponaceous matters, instead of acidulated water, or the use of acids, in connection with the rollers, was not new, as claimed in the specification. He also objected to the specification, on the ground of misdirection, with respect to the scouring of wool. His Lordship, however, did not think the evidence sufficiently developed on either of the points, and Mr. Hill did not press the objection, but proceeded to state the case for the defendant.

The learned counsel first alluded to the correspondence which had taken place. The letters produced were written by the defendant, as agent for his father-in-law, relative to a negociation for the occupation of a mill, at Leeds, which was ultimately let to the plaintiff for the manufacture of the felted cloth, and which the counsel could not perceive had any thing to do with the question of infringing the plaintiff's patent. He then expatiated upon the merits of the fabric produced by the felting process, and asserted its inefficacy, as a cloth, for wearing apparel, though it might do for printed carpeting, and articles of that kind. In 1843, a Mr. Weight took out a patent for the machinery now used by the defendant, under a licence, the validity of which patent is not now under discussion; and Mr. Rawson employed that machinery, without any supposition that it would be considered an infringement of Mr. Williams' rights; and this he did without the least concealment, thinking he was perfectly at liberty so to do. The learned counsel then proposed to divide the question, for the consideration of the jury, into two parts:—first, has there been any infringement of Mr. Williams' patent, supposing that patent to be valid?—and secondly, is Mr. Williams' patent a valid patent? These two points he should keep as distinct as the subject would permit him. The question of infringement resolves itself into this;—are the means which the defendant uses, the means which Mr. Williams has invented? He adopted the word "*means,*" because he found that the patentee intends to limit his claim to the means used for producing the article, and not to the article itself. He says, "I make no claim to felted cloths, as that has been made before to a limited extent; nor even for commercial ends of cloth for carpets, table-covers, and some other things; but you must not make them according to my process." It is, therefore, the process, the means, not the end, which is in dispute before you; for there is no claim for the cloth; there is no claim for the bat from which the cloth is made; there is no claim for the sliver. The claims for these things are conditional, viz., "as made according to my process,—as made by double travelling aprons;" thus the claim is not for the object, not for the end, but for the means.

The alleged infringement is, therefore, considered to be confined to two particulars. My learned friend says, "you have substantially used my invention of the double endless apron, which supports the sliver as it passes from the carding-engine." And again, he says, "you have infringed in that part of your process in which you use the hardening-machine, after the sliver has passed from your drum or from my apron." These are the two, and the only two points upon which it is affected to be said that we have infringed the plaintiff's invention.

Now, the two machines are apparently perfectly distinct; but they say, appearances are deceptive, for the results are the same.

The learned counsel then cited several cases, in which it had been decided, that though machines appeared to be alike, the processes were in reality very different; and that two patents had been sustained, both being considered valid. It is every way desirable to protect patentees; but, in so doing, there may be a great risk of cramping the ingenuity of others who follow in the pursuit of similar objects. The patentee claims the aprons; now we have neither simple nor compound aprons; but we have a drum and threads going longitudinally between each layer of sliver. The drum, says the plaintiff, represents one of the aprons, and the yarns or threads the other apron. Let us see whether this is so. The drum is but a roller, and rollers have been admitted to have been used before, for the purpose of lapping slivers in the old carding-machines; not to be felted, it is true, but for spinning; but it was ready, if required, to be cut into pieces, or portions of bat; indeed, for some purposes, even the lapped sliver was cut into bats, and felted. But, it is said, these were small pieces of bat; true, large pieces were not required for the purposes then contemplated; but if large pieces had been required, the rollers would have been made larger in diameter, and the large pieces would, by that means, have been obtained without the exercise of any ingenuity. This is simply what the defendant has done. With respect to the longitudinal yarns or threads, they say, this constitutes the lower apron,—how can that be? our yarns or threads are worked up with the bat, and form part of the fabric. Some of the witnesses say, they saw, at Leeds, bats made by the defendant without these longitudinal yarns or threads, at which they were surprised,—they did not expect that could have been done; why then, we can produce bats without these yarns, which the plaintiff claims as so important a part of his invention; consequently we get rid of the upper one of the double apron of the plaintiff, and prove its uselessness; which, if not fatal to his patent, clearly relieves us from the charge of infringement. The fact is, that in conducting the bat horizontally, it must have support; but when it is lapped upon a roller, as we have done it, no such support is necessary.

The learned counsel then stated, that, many years ago, a Mr. Booth made felted cloth, by lapping slivers upon a drum or roller: the diameter of the roller is of little importance. The roller was then taken out and the sliver spread upon a long table; and this being repeated by the to and fro movements of the roller, a long bat of many thicknesses of sliver was produced; which was afterwards felted into cloth. The process was, at that time, considered so important by Parliament, that an Act was obtained to shut up the inrolled specification from public view. That specification, it seems, has now been lost, and, therefore, we have only the benefit of oral evidence, taken from an old man, who is since dead, as to the fact of the process having been carried on by Mr. Booth.

The defendant has, it will now be seen, only followed the old known method of proceeding, without any reference to Mr. Williams' invention; and which old method is more simple, and equally effective. As to the diameter of the rollers, upon which laps of the material were made, it is obvious that they would depend upon the length required; and if, for a large order, a considerable quantity of the felted cloth should be wanted to be made quickly, it is obvious that the manufacturer would employ a large roller or drum to facilitate his work; in doing which, no ingenuity of construction was required, as this mode naturally obtruded itself upon his notice, and thence, without difficulty, we should obtain cloth of any extent required, without the necessity of a patent.

This was the matter which the learned counsel had to lay before the jury, as to the first charge of infringement; and, in order to shew that Mr. Booth's invention was not a mere ideal project, he stated, that the Duke of Bedford had, in the year 1804, appeared at a great agricultural meeting in a coat made of cloth by Mr. Booth's process,—the peculiar circumstances of which were, that early in the morning of the same day on which the coat was produced, the wool had been growing on the sheep's back; that it had been shorn, scoured, carded, made into a bat and felted, dyed, and then went to the tailor, who converted it into the coat worn by his Grace.—(At which Mr. Jervis observed, "and it was worn out at night!")

Mr. Hill answered, that Mr. Jervis was an older man than himself, and, no doubt, was there at the time;—he accepted his evidence of the fact. Whether so soon worn out, he did not know; he was, however, aware, that the attempt to introduce such cloth had at that time failed; which was attributed to the present practice of printing, as on cotton, not being then known to be applicable to such woollen cloths. The primitive cause of discontinuing the manufacture of felted cloth was, that they had not then discovered the right market for it. The adaptation of this fabric to carpeting, and such kinds of goods, after having printed them, has now been found to be its proper commercial channel.

With respect to the hardening of the bat, the second point of the invention, to which the learned counsel called the attention of the jury—as the plaintiff says, that, at all events, the defendant has infringed,—he would beg to make a few observations; and in doing this, would direct their observation to the model before him, which represented the defendant's hardening machine. After taking the bat of wool from the large roller or drum, it (being in a very tender state,) is carried into the hardening machine between two cloths, and in that confined state is subjected to pressure between several pairs of moveable boards; the cloths not only carry it forward through the machine, but, by certain small reciprocating movements of the boards in longitudinal directions, the two cloths, in which the bat is wrapped, are caused to rub it, and press it together, by a sort of jumping motion, which effects the operation of hardening, or partially felting its fibres.

Mr. Jervis enquired what would be the effect, if both the cloths or aprons were taken away? Mr. Hill considered that he was not mechanist enough to say what would be the consequence of removing any part of the machine. The Judge observed, "that is, the part of the machine which makes it go on." Mr. Hill apprehended that was the office of the lower apron. The learned counsel then stated, it was of importance that the process of hardening should be performed in a longitudinal direction, and he begged the jury to notice this. In the old modes of felting, when the bat was formed by "bowing," as in the making of hat bodies, the fibres were crossed in all directions, in which case the hardening might be effected by cross and diagonal pressure; but when the fibres are placed longitudinally, that is, side by side, as they are when the sliver is made by the carding-engine, then the motion must be to and fro, in longitudinal directions, in order that the microscopic barbs upon the surface of the wool, and upon some of the furs, should take hold of, and lock into each other; when the natural curling of the fibres will cause them to felt together, which they would not do in any other direction. Therefore, it was a mistake in the patentee to describe a machine for hardening his bats by cross and diagonal pressure.

Now, the plaintiff's hardening machine consisted of rollers, some turning transversely, some diagonally; the defendant's was formed by boards, covered with cloth, all moving to and fro in longitudinal directions. The counsel could not conceive two things more unlike each other, both in principle and appearance, than the two hardening machines before the Court: the plaintiff's performed by the pressure of rollers; the defendant's, by the rubbing-cloths.

Some altercation here took place between the opposing counsel and the Judge, when it was finally decided, that in the defendant's machine the rubbing-cloth moved onward, as a creeping cloth, conducting the bat through the machine; and the upper cloth moved on also, which, Mr. Hill presumed, was merely to prevent the bat being torn; but that matter he would rather leave to scientific men to decide, than venture upon it himself.

The learned counsel then noticed, that the plaintiff claimed no individual parts of his machine; that was right, he could not,—the travelling-apron was old, and had been used in every possible way. Then he claimed the particular use he makes of a travelling-apron; the defendant's use of a travelling-apron is quite different, and for a different object. These are the two points on which the defendant is said to have infringed; and he trusted, that he had fully satisfied the jury that no infringement had taken place, even supposing the patent to be good and valid.

The last matter with which the learned counsel would trouble the jury was, as to the fact of the patent being good, even supposing the infringement had occurred; and, upon this fact, he would solicit their attention for a few minutes longer, whilst he shewed its invalidity; for, upon that ground alone, he maintained the defendant was entitled to their verdict. The counsel then went into a rather elaborate argument as to priority of invention, and the views taken by the law on that matter; and having shewn, that he who first comes with his invention before the public, is deemed to be the first inventor,—he then considered what limitations should be made as to the scope of an original invention, and real improvements upon the first principles, or colorable imitations of it.

First, then, he would enquire, are the parts of the invention on which the plaintiffs rely, the discovery or invention of Mr. Williams himself; for, unless they are, the patent cannot be sustained. One of the plaintiff's witnesses spoke of a conversation which took place between Mr. Williams and himself, and produced a letter respecting this invention;—is that any proof that Mr. Williams was really the inventor? Now, not only do we say, Mr. Williams was not the inventor, but we will produce a person, at that time in his employ, who will tell you, that he invented a certain part of the apparatus included in the plaintiff's specification, and that, as the inventor, he made a claim of £2,000 for the same. The fact is, that Mr. Williams had been brought up a hatter, and had his notions of treating the felt, which would not answer,—whilst Shaw, who you shall presently see, being engaged among carding-machines, had a different view, and, by his knowledge and ingenuity, perfected that which Mr. Williams could not effect.

Then, with regard to the other part of the invention, included in the specification, viz., the means of keeping the apron stretched, there was no mode of doing this effectually, until a man named Milner suggested the introduction of longitudinal guides, which was adopted by the plaintiff. Both these men will be brought into the witness-box, and you will see that they are both men in the lower stations of life; but you will judge of their veracity; and if you should be of opinion that those parts which are claimed by the plaintiff were not the invention of Mr. Williams, but of these other persons, though they might be the servants of Williams, then there is legally an end of the plaintiff's patent. The learned counsel having pointed out to the jury the law in this particular, then proceeded to comment upon the claims in reference to the diagonal position of the raising-cylinders, and the brush for clearing the hairs from the raising-cylinders, and also for the diagonal felting-rollers; all of which he insisted were not new, nor were they any improvement, for they had been abandoned by the plaintiff. He then said, there is also a claim for improved hardening machines, by using heaters in addition to steam-pipes. This, it will be proved, has no novelty whatever. As respects the use of soap and water, instead of acids, I shall satisfy you that there is no novelty in that alteration; and in the scouring of wool, there is a positive mistake in the specification, as no such thing is necessary for the furtherance of the objects contemplated.

Witnesses were then called for the defendant, for the purpose of proving the facts to which Mr. Hill had alluded, which carried the discussion to a great length; after which Mr. Jervis addressed the jury in reply.

Mr. Jervis, in reply, commented upon the evidence brought forward in defence of this action, and insisted that the fact of infringement had been fully established; for, notwithstanding the ingenious opinions and arguments brought forward by scientific witnesses, it was clear that the defendant had employed essentially the same means for forming and conducting the bat of wool. If he had not, in forming his bat, used a long travelling double apron, which was the main feature of the plaintiff's claim, he had obtained an equally extended surface, by his large drum of twenty yards circumference, which constituted an equivalent to the lower apron; and he had employed a series of threads or yarns, which he wound round with the sliver upon the drum, to confine it, which completely answered to the use of the upper apron. And in his felting or hardening machine, he actually employed the double apron, for carrying the bat through between the rubbing surfaces, by which the fibres of the wool became compact, and the bat hardened. As to the pretence that parts of the plaintiff's machinery were not invented by Mr. Williams, the patentee, but by other persons,—the learned counsel considered, that the jury would see with him, that those persons had merely, as workmen, carried out the instructions of Mr. Williams, and could, in no degree, be considered the inventors in that eye of the law. With respect to the objections raised on the part of the defendant, to certain matters in the specification, he argued that they were unimportant, and not at all affecting the validity of the patent. He should, therefore, leave the case in the hands of the jury, who, after hearing the judge's summing-up, would, he had no doubt, be of opinion, that the fact of the defendant having infringed a valuable patent-right had been undoubtedly established; and that the plaintiff would have their verdict, establishing his exclusive right to exercise the very great improvements, which were suggested and carried out by the novel combinations of machinery, and the use of the means set out in the specification.

JUDGMENT.

MR. JUSTICE ERLE.—Gentlemen of the Jury:—This Action is brought, as you have heard, for an alleged infringement of a patent; and there are some pleas on the record about which, I think, there would be no dispute; viz., the fourth, fifth, and the sixth. I shall, therefore, dispose of them by having them entered for the defendant.

[Mr. Jervis,—The plaintiff your lordship means.]

The JUDGE.—The plaintiff.—One, whether there had been a specification? There is no doubt the plaintiff has specified; it has been read to you several times, and several witnesses have said, that a workman of ordinary skill could make the machinery by the specification. The fifth pleads, whether such a patent was granted at all? the sixth is, whether it was granted for the invention specified? About that no evidence has been offered. These will stand for the plaintiff. Three pleas remain; one is, whether this is an invention at all? another is, whether the plaintiff can be correctly said to be the inventor of that invention? and lastly, whether the defendant has infringed the patent claimed by the plaintiff? I propose to deal with these three pleas. Though, it appears to me, the question of infringement follows better after we have ascertained what the invention is, if any.

With respect to the invention, I would draw your attention to the manufacture, prior to the time at which the patent was taken out, 1840. It appears, the process of making cloth by felting had been the subject of attention for a considerable time. It appears, that a Company had attempted the making of cloth by felting, upon the principle called, in this case, "the exhausting system," described by the evidence of Mr. Duncan; and I propose to read to you that evidence upon the question, as to whether this is a new invention, and whether the plaintiff is the inventor. Attempts had been made, and there had been difficulties in getting a bat of sufficient length and evenness. A drum had been employed, which gave them a bat of sufficient length; they laid the fibre on the drum, by exhausting the air within the drum; but there was an uneven surface, and the bat, so unevenly formed, was of very little use.

That was the state of this manufacture immediately prior to the taking out of the present patent. Mr. Williams was concerned and interested in that Company, and was perfectly well aware, therefore, of the steps which had been made,—of the difficulties which had occurred, and that which was desired; and I will read to you Mr. Duncan's evidence on that subject. Mr. Duncan's evidence is; "My attention was directed to the making of cloth, by felting, in 1838, and has been since. The subject was introduced by Mr. Wells, from America. An attempt was made to manufacture by the vacuum; there was a perforated cylinder, and the sliver passed between two rollers; other rollers had teeth which threw the fibres in the air, and in that way it formed a bat on the cylinder. From that the bat went to a hardening machine, consisting of rollers without any travelling apron. It then went to another machine lying in a trough, in acidulated water. This machine had no shogging motion, merely a rolling motion; it was then ready for fulling. The machine was tried at Leeds; Mr. Wilkinson got the machinery made; it was worked at Holroyd's mill. I got it into play in 1839; we found this process did not answer, there were several impediments. It was not a bat with an even surface; the currents of air would bring the fibres into a drift. The roller, with teeth, removed the fibres in lumps; the cloth was not commercial; the bat, travelling through the rollers, adhered to them; the bats adhered to them, which made them tender. I knew Mr. Williams before; he and I were interested in a patent taken out in Mr. Robinson's name. I told Mr. Williams of the defects, after seeing the machinery; he communicated to me two fresh processes (since patented) in 1839; they were the two aprons for keeping equality in the bats. After I had seen Mr. Williams, and told him the difficulties, he desired me to get some rollers for him; this was before December 11th, 1839. Mr. Williams went down to Leeds about Christmas. In February the patent was sealed, the patent now under consideration. I went to Leeds several times afterwards. I was not present at a meeting of the manufacturers at Leeds. I knew Jack Shaw, he was in the service of Mr. Wilkinson in 1839 and 1840. Mr. Wilkinson was trying the patent; he got the machinery made. Jack Shaw left Mr. Wilkinson in May, 1840, and applied for a patent, which I opposed on behalf of Mr. Williams. At our meeting before Sir John Campbell, Jack Shaw went in first; I followed after, and explained it; the patent was refused. I specified within the proper time. A very large sum, £100,000, has been laid out." Then he mentions two letters; one offering to let the Elwood Mills, in 1839, for carrying on the new patent; and another in 1840, wherein Mr. Rawson, the defendant, speaks very favorably of the patent as a useful invention for the manufacture of low goods. He saw the process continually at the Britannia Mills. "I made every description of enquiry in the trade about making cloth by felting, before I embarked with Mr. Williams. So far as I heard or knew, the use of Mr. Williams' apron was new in making cloth by felting." He speaks then as to a diagonal machine,—that, I need not read; then he is cross-examined, and I am not aware that there was anything material on the cross-examination.

If Mr. Duncan's evidence is believed, I think it would establish that the invention of Mr. Williams is new, at least, according to Mr. Duncan's evidence; nobody else competes with Mr. Williams. You will observe, that it was thought to be important; there had been difficulties and impediments. Mr. Williams' attention was drawn to them, and the present patent was the result, according to Mr. Duncan's evidence, of Mr. Williams' consideration. Now, the evidence that has been offered by Mr. Duncan, was confirmed by Mr. Wordsworth, who says, that he received an order from Mr. Duncan; and it is confirmed by Mr. Wilkinson, who was there, from time to time, superintending it. The evidence brought forward in answer to this, does not contradict the material ground taken up by Mr. Duncan, Mr. Wilkinson, and Mr. Wordsworth; but merely claims, that a portion of the invention specified was the result of the invention of the witness Jack Shaw. That has been laid before you; one portion is claimed by Jack Shaw, another is claimed by Mr. Milner; but, gentlemen, independently of any credit, or discredit, that may be attached to the evidence of Jack Shaw, I take the law to be as stated by the learned counsel for the plaintiff: If a person has discovered an important principle, and employs engineers, or agents, or other persons, to assist him in carrying out that principle, and who, in the course of the experiments arising from that employment, make valuable discoveries accessary to the main principle, and tending to carry that out in a better manner,—the law has been correctly stated by the learned counsel; that such improvements are the property of the inventor of the original important principle, and may be embodied in his patent. And if so, the patent is not void by the improvements that an agent or servant may suggest, if this subordinate improvement carry out the primary important discovery. It appears to me, whether there be discredit attaching to the evidence of Jack Shaw, or not, taking his evidence according to his own statement, the improvement he claims is, that hitherto the bat had been formed by a travelling-apron, by successive layers of sliver; he suggested the improvement that there ought to be travelling-aprons, one above the other; so that instead of a bat of the length of nine yards, formed by one travelling-apron only, there might be two or three travelling-aprons, but one above another, communicating with each other; by which they would get twenty-seven yards,—and, of course, by that, they would get thirty-six yards, according to his evidence. Now, it appears to me, it was an improvement upon a principle that had been invented by some one else; namely, the laying of successive slivers of the wool upon some revolving surface, which was for the purpose of being made into a bat. With respect to Shaw, therefore, it does not appear to me to deprive Mr. Williams of his claim. With respect to Milner, much less, the evidence of Milner, he is a respectable man; his evidence, I take it, may be fully taken; but the evidence does not tend, on the same ground, to destroy Mr. Williams' right, because his evidence is after the discovery had been described by Mr. Williams—the travelling-aprons. The question was about the best mode of keeping these aprons distended; and Mr. Williams had come down with the V-guides; and there had been also some attempt to keep them distended by means of some pulleys. Milner says, he being acquainted with the longitudinal-guides, represented to you,—he having seen guides of that sort in use elsewhere,—proposed to keep the aprons distended by these guides; and Mr. Williams, by a slight alteration, having a square groove, instead of a round one, adopted these guides. If you are of opinion (as there can be no doubt) these are in the nature of subordinate improvements, fitted to carry out the great principle in view,—it was one of those improvements which Mr. Williams had a right to embody.

I am not aware that there is—in the substantial part of this case—that there is any other conflict with the evidence of Mr. Duncan and Mr. Wordsworth. But, before I pass to the subject of the invention being new, and Mr. Williams being the inventor, I would draw your attention minutely, so far as it is important, to the specification that is claimed; and then seek to dispose of those minor matters brought forward to destroy the patent. Supposing the defendant should fail upon what might be called the substantial merits beween the parties.—Now, Mr. Williams having made the invention, he is called upon to specify the invention. He says, "my invention of certain improvements in the manufacture of woollen, and other fabrics, of which wool or fur form a principal component part, and in the machinery employed for effecting that object, relates chiefly to the making of cloth by felting alone, without spinning or weaving, and consists in a new combination of machinery, apparatus, and process. First, for obtaining a long, even, and uniform bat of wool, or other materials, of any required length, width, or thickness, suitable to be made into commercial ends or pieces of cloth, and afterwards for the purpose of producing such fabrics, or ends, or pieces of cloth, composed of all the various well-known felting substances, such as wools, furs, and the hairs of animals, and which I use either separately or mixed." Having stated this as his claim,—cloth by felting alone, he says, "the raising machine, I have hereafter described to be used in the finishing of cloths, is applicable chiefly to cloth made by felting alone, but is also applicable to other cloths." Then he says, "I prefer that the wool should be well scoured." One witness has said that the specification misleads with respect to that direction; but it turns out that the wool used for felting is almost always scoured, and properly scoured, for the purpose of being used for felting; and two kinds of wool have been mentioned which are not scoured, because they arrive in so clean a state that scouring is not wanted, and would be an injury to it;—that is one of the objections to the specification. I shall go through them, and leave them for you to decide whether upon any one of these minor points, the specification can be said to be bad. Then he states the way in which the bat is to be made, representing how common wool should be made, and how fine wool should be formed. He describes the way in which the bat should be made to pass on the travelling aprons; then he mentions, "during this operation it is supported and sustained in contact with the apron A, C, by the apron B, D, for which support this later apron is intended." Then he proposes a variety of other applications. He mentions the horizontal guides. Then he mentions that the continuous bat, having been obtained in the manner that has been mentioned, it is then taken to the hardening machine, and placed between the rollers. "These rollers are wrapped round with an elastic cloth, and the lower set are furnished with a travelling apron, as represented at A, B." He provides for the use of different kinds of wool. Then he mentions one improved felting machine. He goes on to say, "each set of upper rollers should be weighted upon the lower ones, for the purpose of accommodating a certain degree of pressure to all the different degrees of thickness, or accumulated thicknesses of various goods submitted to their action. D, D, is a box or cistern, lined with lead, for holding a supply of hot water, or soap-suds, and in which the lower rollers can be more or less immersed by regulating the quantity thereof. In the felting of fibres together, where the fabric, being felted, is not held together by threads, acid, or acidulated waters have always been used, because they assist the process; but I use a solution of soap, or sopanaceous matter, in contradistinction and preferable to acids or acidulated waters; which solution is kept in a heated state, as after mentioned There are disadvantages attending the use of acids, which are avoided by the application of a soapy solution in lieu thereof." That is another of the minor points. He is claiming the use of soap, and in felting, and this turns on the evidence of Mr. Duncan, that in the process of making cloth by felting alone, prior to the present patent, acidulated waters were used on that part of the process, where soap and water is used by Mr. Williams, the patentee. Now nobody has been called before you to shew that in the process of making cloth by felting alone, they use acidulated water and soap and water—nobody has been called but Mr. Duncan; and there is no evidence as to whether acidulated waters are used, or soap and water, except that of Mr. Duncan, who says, "under Mr. Robinson's patent we used acidulated water." Now the claim of Mr. Williams is, that "where cloth is made by felting alone, where acidulated waters were used before, I use soap and water." Now, it appears if Mr. Duncan's evidence is true—there is nothing to contradict it—that is established; and it is not an absolute claim for using soap and water, when the cloth is put under the rollers for felting, but it is when made by felting alone: "where acidulated waters are used, I advise the use of soap and water." Then we come to that part of the specification which is as to diagonal, or cross-felting. "In order to increase the felting action it is very desirable to allow the felting rollers to act upon the cloth in as many directions as possible." And then he points out that in figure twenty, rollers "are placed at an angle with the feeding apron of somewhere near forty-five degrees. These two rollers have a velocity given three to four times that of the feeding apron; upon which the cloth is thrown in regular folds as it enters, laying at nearly the same angle as the position of the rollers;" and when he comes to the claim, it is, "I also claim the method of diagonal, or cross-felting, as effected by the feeding-rollers, figs. twenty and twenty-one, herein-before described." He has described something particularly in the manner of the rollers giving three or four times the velocity of the feeding-apron upon which the cloth is thrown into folds; the diagonal or cross-felting is that for which the claim is given. Mr. Farey is called to prove that in Robinson's, it is diagonal felting, but nothing about diagona rollers, and nothing about being thrown into folds; and when Mr. Farey was examined by Mr. Hill, he says, the means appeared different; and in this part of the patent it is the means only that Mr. Williams has claimed to be the inventor of; not that it could be said, if there had been the adoption of Mr. Robinson's invention, and there had been merely a colorable variation, the objection would not have been tenable. But the mode Mr. Williams has described, according to the two specifications, appears substantially different; and I do not find the defendant's counsel carry forward any examination to shew that they were in reality the same, with a colorable difference.

The other objection is with reference to the raising machine. In the drawing (figures twenty-two, and twenty-three), is represented the frame of a new raising machine; and there are two cylinders covered with wire cards, or teazels, placed therein, and they are described as placed in a manner across each other, and are described to be placed in a position which is new. So far as the evidence goes, where diagonal cylinders for raising the nap were so placed before, (I take that to be it,) the print of Mr. Walton's machine has been put in. The way in which these cylinders acted for raising the nap, was apparent to your eye; and the drawing the plaintiff made has been put in. The position is perfectly different from the claim at the end, and that we are to go by, and the claim is in these words: "I also claim, in the raising machine, figures twenty-two, and twenty-three, the diagonal positions of the raising cylinders, as hereinbefore described,"—(he is therefore particularly limiting his claim to the diagonal position of the raising cylinder, as hereinbefore described) "and particularly also the use of other or opposite revolving cylinders, whether covered with cards, or any other material for clearing raising cylinders." Now there is some evidence about the process being in some degree the same. If you have been comparing the two drawings that were put before you, or wish to see them again, and considering them, should think that the two motions of raising the nap were the same, you would say so in your verdict, and say that the whole claimed by the plaintiff was not new. But if you are not satisfied by the evidence that they were substantially the same, then that which is the best objection, or last but one, will be disposed of, and you will consider the last part of the case.

Now there was some evidence attempted to be given by John Platt, who was foreman of Mr. Walton's machinery; and it was stated that there had been an attempt made to apply heaters to some machinery that he had. But when the cross-examination came, it turned out that the heaters were applied for a different purpose. They were in the nature of irons, in order first, in ironing, to get a smooth nap; and it appeared further, by the evidence, that the machine had not turned out successful, and not been in general use at all; but particularly with respect to the cross-examination, the heaters were for a totally different purpose. The evidence on both sides is before you; and unless you see any portion of the evidence more than occurs to me, the case on the part of the plaintiffs is not damaged by that ground of attack.

Now, gentlemen, then suppose you are of opinion that the invention claimed by the plaintiff, and set out in the specification, was, in all respects, a new invention, and that you are of opinion that the plaintiff was the inventor of the whole invention, that is, of the main principle,—you will be so good as to bear in mind, clearly, what are the substantial parts of that invention, before you come to a consideration of whether the plaintiff is guilty of infringing the plaintiff's patent. I have told you what the state of the manufacture was, prior to the time of the patent being taken out. I have read to you, gentlemen, the outline of this patent, and you will bear in mind that it was most material to get a bat of a sufficient length, thickness, and evenness. That was the first step required in the process of making cloth by felting alone, to get a bat of sufficient length, thickness, and evenness; and the second step that was required—looking at Mr. Robinson's patent—the second step that was required, was to protect the bat, so obtained, during the first and subsequent processes of felting,—to protect it from being damaged in any way by rubbing, and other rough treatment—according to the language of Mr. Carpmael—which it had to undergo during the processes of hardening and felting. Now, the outline of the plaintiff's claim is, for the first step, that "I take the sliver of wool upon a carrying apron, and upon that carrying apron I carry it to a revolving upper apron; upon that revolving upper apron, the sliver is taken up, and that revolving apron passes round and round, till as many successive layers of sliver have been accumulated upon it, as constitute the thickness for the required bat." "That," says the plaintiff, "is the valuable discovery I made, beyond what existed at the time when Mr. Robinson had a patent; and the second step that I make is, applying, in the process of hardening and felting the bat, the protection of an under apron at all times; and an under and upper apron when the treatment in the course of felting becomes extremely rough.

That is an outline, and I will read to you the exact words of the beginning of his claim, for he claims an important principle. I will read to you the exact words, because they are all-important in the deciding of this point. "I wish it to be understood that I do not claim it as my present invention any individual parts of the same"—that is, the variety of matters that have gone before, I do not claim the individual parts—"but I claim the adaptation of a double apron, or aprons, or compound aprons, and rollers or cylinders, for the production of bats, as herein described, from the long sliver, and the different means, herein described, for keeping these aprons, together with the bats, in a smooth and even condition." That is the last stated,—the aprons, and the means for keeping the aprons distended, as before described.

"And I claim the extended sliver itself, as herein described, applied to forming a bat by successive folds, or layers, for the production of long or commercial ends of cloth, without spinning or weaving."

Now that is the second step, wherein the claim is for the extended sliver itself, as herein described, applied to forming a bat by successive folds or layers, for the production of long or commercial ends of cloth. He claims the apron, and he claims the extended sliver for forming the bat to be made into cloth without spinning or weaving. "And I also claim the improvement of the hardening machines, figures 2, 3, 12, 13, 14, 15, by using the heaters in addition to steam-pipes or pans, or in conjunction with a wetted apron, as herein-before mentioned, and using travelling aprons, as herein-before described," that is, in the process of hardening. Therefore, gentlemen, so far as the nature of the invention is concerned, the claim is for the extended sliver itself; the use of travelling aprons in hardening that sliver in the bat to be made into felted cloth. Has the defendant infringed this invention? If he has adopted the same means, of course he has infringed it. If he has taken advantage of the plaintiff's invention and made some colorable variation of the means that the plaintiff has adopted, he would be also guilty of an infringement. It is a question requiring your particular attention, to see whether he has subsequently taken advantage of that which the plaintiff had invented and specified as his invention. Has he subsequently taken advantage of that? Because, if he has adopted the material part of the plaintiff's invention, the materiality of every matter is always with reference to the end to be produced; the end to be produced was, cloth made by felting alone, without spinning or weaving. The important part of the plaintiff's invention would be that which tended most materially to produce that result, and bearing in mind the two great steps the plaintiff has claimed —one, the extended sliver, as herein described, applied to the forming a bat; which sliver is formed on a travelling apron;—he claims the travelling apron, and the extended sliver itself, and claims also, the using of travelling aprons in hardening the bat which had been so obtained. You will say by your verdict whether the defendant has taken advantage of the plaintiff's invention in either of these steps. If he has in either of them, your verdict would be against him, of course: if he has in both, the same result would follow.

Now, gentlemen, with respect to that question, I do not know that I can with advantage read over to you the evidence of Mr. Carpmael, and Mr. Cowper—I would do no more than read over—[The Jury: We will not trouble your lordship.] on one side; and Thomas Laycock, and Joseph Weight, the last witness, or the last but one, and Mr. Farey, on the other side. The question before you depends to a very great degree indeed upon the models of the machinery that have been offered before you; and I have mentioned that the material point of every invention is the result produced, and the means towards the end. Here were two steps to be made; to get a long bat, and a thick bat, and to protect that bat in felting. Now, I may describe the plaintiff's invention this way; the plaintiff obtains that purpose by travelling aprons; the defendant obtains that purpose by a drum. The drum, in external appearance is extremely different from the travelling apron; but if they are to be judged of with a view to the result to be produced, namely, the obtaining a bat by successive layers of sliver,—the drum and the travelling apron appear to be almost identical instruments. The evidence of Mr. Farey on that subject you may remember. In the early part of his examination he considered them to be precisely the same. The drum was often used in cotton manufacture, and to have precisely the same effect, it was made to act on the fibres in the defendant's. There is no doubt, in the plaintiff's plan, the sliver is taken from the doffing comb into the under carrying apron; it is deposited on the upper travelling apron, which lies in a horizontal position, and lying in that position, the sliver would be apt to fall; but it was supported on the other side; and there is no doubt the plaintiff uses the under apron, not merely for carrying the sliver, but also to support it on the upper apron during the process of the accumulation of these slivers. There is no doubt that there is the prominent use of the under apron in the plaintiff's machine. It has been contended in this case that there is the same use obtained in the defendant's machine, partly from rollers placed above the drum, on which the sliver accumulates; and I think these rollers can hardly be said to be an imitation of the plaintiff's carrying apron. They were not new instruments on which the sliver was accustomed to accumulate; they were known instruments, to press it down where it was wanted in the course of ordinary manufacture. It was also pressed on the part of the defendant, and so far you will consider it—whether the strings and bobbins had the effect of an under apron, in supporting the sliver that accumulates on the defendant's drum. A good deal of evidence has been offered to shew —and strong evidence to shew—that in the earliest part of the accumulation of the slivers, no threads are used at all; and that when the thickness of the bat is half formed, that then the threads were, for the first time employed; and one layer is used for the purpose of giving strength to the bat, and not for the purpose of holding it on. You will weigh and consider whether you are satisfied with the evidence on the part of the defendant to explain that. It should be observed, according to other evidence in the case, the desired object is attainable, and is attained by the defendant, whether the threads are there or not, and whether the upper rollers are there or not. The drum appears covered by fustian, something to which the sliver would adhere, and something, without which, the sliver would not adhere to the smooth wooden drum. According to the evidence, it appears that by the fustian it adheres to that drum, and by reason of that, as the drum revolves, any accumulation of slivers may be put on the drum, and a bat of smoothness, thickness, and length, is obtained. If you are of opinion, looking at the evidence of Mr. Carpmael, and at the evidence I have mentioned of Mr. Laycock and Mr. Farey,—you are of opinion that the defendant imitated the patent invention, and substituted that which was an immaterial difference, namely, the drum for the travelling aprons, and took advantage of all that was important in the plaintiff's discovery, by forming the bat in the manner mentioned,—although it may appear to be so extremely different—if you are of that opinion, he would be guilty in the first respect.

With respect to the second ground on which the plaintiff relies, it is as to the hardening of the bat so obtained by his machine. The failure of Mr. Robinson was, in sending the bat, which consists of frail material—the fibre of wool as it comes from the doffing comb—sending that bat, so formed, to be the subject of the felting process. You know the process that now takes place, and the various ways by which the fibres are worked together, till, by the action of felting, they form a cloth.

Now it appears that the failure of Mr. Robinson's invention had been in the subject of the bat; I have described the action of the rollers without the protection. The lower rollers took locks off the bat as it passed through. The bat, therefore, became thinner in certain parts, and when it was felted, the cloth was not even throughout; it was not equally strong, and by reason of that, was not a mercantile commodity. The point in the second process was,—having obtained a bat of proper thickness and length, to send it through the felting machine without damage from the under rollers. The discovery of the plaintiff was to send it through with an under carrying-apron, in the same manner as it took it with the upper carrying-apron. The defendant's machine unquestionably sends the bat through that first felting process, with the protection of that carrying-apron, which is part of the plaintiff's discovery, and which was the material thing,—which was the desideratum, to make good the second step in the process; for you could not come to the desirable point of having cloth by felting alone, unless you could protect the bat when going through the felting. Now, according to the evidence in the case, it seems clear that the defendant uses an under carrying-apron, to defend the bat, and the upper one; he uses them both, but if either of them, mere material parts of the plaintiff's invention, the defendant had no right to use them for the purpose, and if he did use them, he was guilty of infringement. It has been contended that the machinery which the defendant forms, operates more equally; the fibres are supposed to be laid parallel at the time they are the subject of felting;—therefore, the longitudinal rubbing is more beneficial than the rubbing, which not merely rubbed it longitudinally, but the rollers have the transverse action which you saw. It is said the felting is much better made. That was not the observation to which I drew the attention of the counsel for the defendant; my observation was rather to draw his attention to the fact that that was in answer to the claim. The objection is, as I have said, to the carrying-apron, and the protection of the bat. It does not matter whether you can, by machinery, felt the bat by a more speedy and more effectual manner, than the machine Mr. Williams has invented,—that is no answer to your using Mr. Williams' invention in respect to the carrying-apron, and the evidence of Mr. Farey; and a great deal of the examination of Mr. Farey was upon the point that it was a more effective instrument; and as far as it appears to me, the observation of the learned counsel for the plaintiff, is well founded. An enquiry was made about the importance of the carrying-aprons, which protect the bat at the time it goes through the felting process.

Now, the evidence of opinion is not the best of the kind. The evidence of Mr. Farey may be one way; Mr. Carpmael and Mr. Cowper may give their evidence on the other side. Some weight would be given to the conduct of the defendant himself; he is constantly in the business;—I take it for granted, has a deep and earnest interest in the improvements made in the manufacture in which he is concerned. He is aware that goods have been taken, from time to time, from the plaintiff; he is aware of what claim he makes; he has twelve months' consideration, and, at the end of that time, he writes favorably of the invention, and speaks of it as an important invention. Certainly, that would be good evidence with respect to some other points I have drawn your attention to. It is for you to say, whether it has any weight on the subject of the infringement, which I have drawn your attention to; because, Mr. Rawson must have known that which was the ground of failure before, and that which enabled the plaintiff to produce an article likely to sell in the market. His attention was drawn to that, the result was obtained by both, and these two processes must have passed through his head, whether it was done by the mode the plaintiff adopted, or by his. But you will be so good as to say by your verdict, whether you think the invention was new; whether Mr. Williams was the inventor; and whether, considering the subject in the way I have presented it, you think the defendant has infringed the plaintiff's patent, in either, or both of the points I have described.

The Jury then retired.

Mr. Jervis.—In the event of the plaintiff getting a verdict, will your lordship certify as to the validity of the patent?

The Judge.—Yes; there is no doubt as to the validity of the patent. I do not know that there can be any difficulty with the jury.

Mr. Jervis.—We need not detain your lordship.

The Jury having been absent about twenty minutes, returned, and his lordship again took his seat.

The Foreman.—My lord, we find for the plaintiff on each of the three points: First,—that it is a new invention. Secondly,—that Mr. Williams is the inventor. Thirdly,—that Mr. Rawson has infringed the patent.

The Judge.—Infringed it in one, or both respects?

The Foreman.—Both.

Mr. Butt.—My lord, will you be so good as to certify for the patent?

The Judge.—I have.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1845.
Mar. 28. *Robert Husband*, of Birmingham, for an apparatus for delineating the form of parts of dress.
28. *Flushtheimer & Hesse*, of Back Piccadilly, Manchester, for a collar.
29. *Thomas Purdon*, of Hull, for an improved portable lavoir.
29. *John Obadiah Newell Rutter*, of Black Rock, Brighton, for a postage-stamp wafer and label damper.
31. *David Aust*, of 28, Somerset-place, New North Road, Hoxton, for a mop-head fastening.
Apr. 1. *William Dawson*, of Otley, in the county of York, for a paper-cutting machine.
2. *Deane, Dray, & Deane*, of the Finsbury Iron Works, for a yacht stove.
3. *John Huggett*, of Hoad's-buildings, Hailsham, for pincers or nippers.
4. *Stuart & Smith*, of Roscoe-place, Sheffield, for a register-top plate stove.
4. *Robert Hazard*, of Regent-place, Clifton, for a towel-horse, serving also as a stand for a shower-bath.
7. *William Crane Wilkins & Matthew Samuel Kendrick*, both of Long Acre, London, for an improved spirit lamp.
7. *Robert Bradshaw*, of Lower Ormond Quay, Dublin, for the Albert valve, for cornet-à-pistons, trombones, opheclides, &c.
8. *Ross & Sons*, of 119, Bishopsgate-street, for a triple hair brush.
8. *Ross & Sons*, of 119, Bishopsgate-street, for a double anti-pressure nail brush.
9. *Robert Edwards*, of Charlbury, Oxfordshire, for a glove.
9. *Thomas Shutt*, of Wolverhampton, for a door spindle.
9. *Thomas Ridsdale*, of 54, Minories, for a ship's lamp.
11. *Henry Lewiston*, of George-square, Hoxton, for a smoking tube.
14. *Charles Montague*, of Gloucester, for a design for communicating an intermittent motion to machinery.

Apr. 14. *Charles Montague*, of Gloucester, for a design for communicating an intermittent motion to machinery.

14. *E. Gilbert*, of Falmouth, for an economic signal light or lamp.

15. *A. Nevill & Co.*, of 121, Wood-street, for a cravat.

18. *Frederick Snowdon*, of Diamond Hall Tilery, Sunderland, for a hand tile and pipe machine.

23. *W. Grounsell*, of Louth, Lincolnshire, for an improved clod crusher.

23. *Joseph P. Oates*, of Sutton Coldfield, near Birmingham, for the cornutum, or drawing-room cornopean.

24. *C. Minifie*, of 36, College-green, Bristol, for a shirt.

25. *Charles & Joseph Grego*, of 27, Leather-lane, Holborn, for a double dressing mirror.

26. *David Middleton, jun.*, of Bail Gate, Lincoln, for a galvanic shower bath.

26. *Frederick Brown*, of Luton, Bedfordshire, for an improved register stove.

List of Patents

That have passed the Great Seal of IRELAND, to the 16*th of April*, 1845, *inclusive.*

To Robert Gordon, of Heaton Foundry, Stockport, in the county of Lancaster, millwright and engineer, for improvements in grinding wheat and other grain, and dressing flour or meal; which improvements are also applicable to grinding cement and other substances.—Sealed 20th March.

Richard Haworth, of Bury, in the county of Lancaster, engineer, for certain improvements in steam-engines.—Sealed 21st March.

Richard Watson, jun., of Cloth Fair, in the City of London, engineer, for improvements in draining, and machinery for boring for such and other purposes.—Sealed 29th March.

Louis Antoine Ritterbadt, of Gerard-street, Soho, Middlesex, for improvements in preserving and removing incrustation in steam-boilers and steam-generators.—Sealed 15th April.

Robert Oxland, of Plymouth, in the county of Devon, chemist, for improvements in the manufacture of chlorine.—Sealed 16th April.

List of Patents

Granted for SCOTLAND, subsequent to March 22*nd*, 1845.

To Robert Heath the younger, of Kidsgrove, Staffordshire, coal agent, for improvements in heating ovens and kilns, used in the manufacture of china, bricks, tiles, and other articles of earthenware.—Sealed 24th March.

John Berkely Cotter, of the city of Dublin, Gent., for improvements in the preparation and manufacture of woven fabrics or tissues, applicable to various useful purposes.—Sealed 25th March.

John Baptiste Simion Teissier, of Paris, engineer, and Antoine Hyppolyte Triat, of Paris, Professor of Gymnastics, for improvements in propelling vessels, carriages, and agricultural machines.—Sealed 26th March.

William Willcocks Sleigh, late of St. James's-square, in the county of Middlesex, but now of Stamford, Brook House, Chiswick, in the same county, Doctor of Medicine, and surgeon, for a hydro-mechanic apparatus for producing motive power.—Sealed 2nd April.

Thomas Dunn, of Manchester, engineer, for certain improvements in, or applicable to, turn-tables, to be used on, or in connection with, railways.—Sealed 4th April.

John Sykes, of Hollenwood, in the county of Lancaster, machine-maker, and Adam Ogden, of Hey Chapel, in the parish of Ashton-under-Lyne, in the said county, Gent., for certain improvements in the machinery for preparing and cleaning wool, cotton, and similar fibrous material.—Sealed 4th April.

William Cormack, of the Commercial-road, London, chemist, for improvements in purifying gas.—Sealed 4th April.

Robert Kerr, of Thread-street, Paisley, manufacturer, for certain improvements in hand-loom weaving, and for producing a double fabric of raised figured work in the same loom by process of weaving.—Sealed 7th April.

John Spencer, of the Phœnix Iron Works, West Bromwich, Staffordshire, agent, for improvements in manufacturing or preparing plates of iron or other metal, for roofing and other purposes to which the same may be applicable.—Sealed 7th Apr.

James Napier, of Hoxton, in the county of Middlesex, dyer, for improvements in treating mineral waters to obtain products therefrom, and for separating metals from other matters.—Sealed 8th April.

George Hurwood, of Ipswich, engineer, for improvements in apparatus for moving and fastening windows.—Sealed 14th April.

Charles Robert Roper, of Hackney, London, chemist, for improvements in the manufacture of gelatine.—Sealed 14th April.

John Taylor, of the Adelphi, London, Gent., for improvements in separating metals from each other, and from certain combinations with other substances,—being a foreign communication.—Sealed 16th April.

John Chanter, of the city of London, patentee and proprietor of patents, and civil engineer, for improvements in furnaces, fire-bars, hot-air generators, and flues.—Sealed 17th April.

Stephen Perry, of Woodland-place, St. John's Wood, London, for improvements in springs to be applied to saddles, to girths, to belts, and bandages; for improvements in the application of springs to locks and other fastenings, to paper holders, to window-blind racks, to window sashes and doors, to seats and elastic surfaces for sitting and reclining upon; and improvements in elastic bands.—Sealed 19th April.

Samuel Hall, of King's Arms Yard, London, civil engineer, for improvements in steam-engines, boilers, furnaces, and flues; in consuming fuel; in preventing smoke; and in propelling vessels.—Sealed 19th April.

William Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for certain improvements in treating and preparing oily or fatty matters,—being a communication.—Sealed 22nd April.

Samuel Porritt, of Edenfield, in the county of Lancaster, manufacturer, for certain improvements in machinery or apparatus for preparing and carding wool.—Sealed 22nd April.

New Patents

SEALED IN ENGLAND.

1845.

To Charles Pooley, of Chorlton-upon-Medlock, cotton spinner, for improvements in certain machines used in preparing to be spun and in spinning cotton, wool, and other fibrous substances. Sealed 27th March—6 months for inrolment.

William Bowser, of Parsons-street, St. George's in the East, and William Bowser, of the same place, engineer, for improvements in ships' fire-hearths. Sealed 27th March—6 months for inrolment.

Richard Weller, of Capel, near Dorking, brick and tile manufacturer, for improvements in the manufacture of drain and other tiles and pipes. Sealed 27th March—6 months for inrolment.

John Baptiste Simion Teissier, of Paris, engineer, and Antoine Hyppolyte Triat, of Paris, Professor of Gymnastics, for improvements in propelling vessels, carriages, and agricultural machines. Sealed 27th March—6 months for inrolment.

Joseph Conrad Marie Baron de Liebhaber, of Paris, for improvements in blasting rocks and other mineral substances, for mining and other purposes, and in apparatus to be used in such works,—being a communication. Sealed 27 March—6 months for inrolment.

Wilton George Turner, of Gateshead, Doctor in Philosophy, for improvements in the manufacture of caustic alkalies, soda, and potash, and their carbonates; and also in the manufacture of the ferro-cyanates of soda or potash. Sealed 27th March—6 months for inrolment.

Dennis Woodin, of Upper Park-place, Regent's Park Road, veterinary surgeon, for an improvement in the form of shoes for horses or other animals, and in the process of accomplishing the same,—being a communication. Sealed 27th March—6 months for inrolment.

Richard Archibald Brooman, of Fleet-street, London, Gent., for a thread made from a substance not hitherto applied to that purpose; and also the application of it to the manufacture of piece goods, ribbons, paper, and other articles,—being a communication. Sealed 27th March—6 months for inrolment.

Henry Tylor, of the firm of Tylor & Pace, of Hackney, Gent., for improvements in fabrics used for, and applicable to, curtains, screens, blinds, and other like purposes. Sealed 29th March —6 months for inrolment.

James Higgins, of Salford, machine maker, and Thomas Schofield Whitworth, of the same place, mechanic, for certain improvements in machinery for preparing, spinning, and doubling cotton, wool, flax, silk, and similar fibrous material. Sealed 2nd April—6 months for inrolment.

William Robinson Malley and George Mason, jun., of Ipswich, contractors, for improvements in collecting and raising stone or substances from below water. Sealed 2nd April—6 months for inrolment.

Thomas Lidbetter, of Droitwich, manager of salt works, and John Loughton, of the same place, carpenter, for improvements in the manufacture of salt. Sealed 2nd April—6 months for inrolment.

Otis Tufts, of Boston, America, engineer, for a certain new and useful mode of building or constructing either the hulls or decks (or both, as the case may require) of ships, boats, and various other sailing or floating vessels, made of iron or other suitable metal or metals. Sealed 2nd April—6 months for inrolment.

James Hamer, of Wardour-street, St. James's, machinist, for improvements in enema syringes and in stomach and other pumps. Sealed 7th April—6 months for inrolment.

John Rand, of Howland-street, Fitzroy-square, artist, for improvements in certain stringed and wind musical instruments, and the application of certain improvements to certain of such instruments,—being a communication. Sealed 7th April—6 months for inrolment.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, mechanical draftsman, for certain improvements in machinery or apparatus for forging and stamping metals; applicable also to other useful purposes,—being a communication. Sealed 7th April—6 months for inrolment.

Thomas Robinson Williams, of Love-lane, Aldermanbury, Gent., for a new or improved preparation and manufacture of certain fibrous and other materials, for the production of a fabric suited, among others, to the purposes for which horse-hair seating and horse-hair cloths are usually employed. Sealed 7th April—6 months for inrolment.

William Hattersley, of Regent-street, Westminster, piano-forte maker, for certain improvements in the construction of piano-fortes. Sealed 7th April—6 months for inrolment.

Thomas Jarvis, of Bryanstone-street, Gent., for improvements in preparing extracts from certain vegetable matters, and in the apparatus connected therewith; which apparatus is also applicable to other similar purposes. Sealed 7th April—6 months for inrolment.

John Dewrance, of Liverpool, engineer, for certain improvements in steam boilers, and in the construction, composition, and manufacture of bearings, steps, and other rubbing surfaces of steam-engines and other machinery; and also for a method of lubricating the same. Sealed 7th April—6 months for inrolment.

Edward Bury, of Hanslope, Buckinghamshire, civil engineer, for certain improvements in locomotive engines, carriages, or waggons, running upon railways, or common roads, for the prevention of accidents. Sealed 7th April—6 months for inrolment.

Esprit Galibert, of Bridge-street, Southwark, for certain improvements in hats. Sealed 7th April—6 months for inrolment.

William Wylam, of Gateshead, Durham, Esq., for certain improvements in artificial fuel, and in machinery for manufacturing the same. Sealed 7th April—6 months for inrolment.

Christopher Binks, of Sunderland, chemist, for improvements in the application and use, as manure, of certain substances or compounds, not hitherto so employed, and for improvements in manufacturing such compounds. Sealed 7th April—6 months for inrolment.

Thomas Metcalfe, of Elizabeth-street, Eaton-square, brush maker, for certain improvements in propelling carriages, which improvements are also applicable to driving certain machinery. Sealed 7th April—6 months for inrolment.

Giacomo Silvestri, of Naples, Physician, for certain improvements in preserving animal and vegetable substances from decay,—being partly a communication. Sealed 7th April—6 months for inrolment.

John Hick, of Bolton-le-Moors, engineer, for certain improvements in machinery or apparatus for cleaning wheat, and other grain or seeds, from smut or other injurious matters,—being a communication. Sealed 7th April—6 months for inrolment.

Dominic Frick Albert, of Manchester, Doctor of Laws, for certain improvements in the manufacture of candles. Sealed 7th April—6 months for inrolment.

James Lamb Hancock, Frederick Augustus Lamb Hancock, and William Lamb Hancock, of Guildsfield, Montgomeryshire, for an improved rotary steam-engine. Sealed 7th April—6 months for inrolment.

John Henry Shearman, of Clements-lane, merchant, for a method of separating and extracting the grease and oil, and oleaginous matter from water, in which any such matter may be contained, more particularly water which has been used in the cleansing of wool, spun wool, and woollen cloth. Sealed 7th April—6 months for inrolment.

Charles Powell, of Smith's-buildings, Leadenhall-street, farrier, for certain improvements in the construction of horse-shoes. Sealed 9th April—6 months for inrolment.

Elijah Galloway, of the Strand, engineer, for improvements in propelling railway carriages. Sealed 10th April—6 months for inrolment.

William Cormack, of the Commercial-road, chemist, for improvements in purifying gas. Sealed 10th April—6 months for inrolment.

Samuel Stocker, of Canonbury-place, engineer, for improvements in machinery or apparatus for lifting, forcing, or conveying liquids in vessels for holding liquids; and improvements in water-closets. Sealed 10th April—6 months for inrolment.

John Coope Haddan, of Liverpool-street, King's-cross, Middlesex, engineer, for improvements in preparing sleepers, chairs, and spikes, and constructing wheels for railways. Sealed 14th April—6 months for inrolment.

Frederick Rosenborg, of Kingston-upon-Thames, Hull, Gent., for certain improvements in machinery for cutting and shaping wood, and other materials, into various forms or figures; and also for cleaning and smoothing the surfaces of the same forms or figures. Sealed 15th April—6 months for inrolment.

George Carter, of Willenhall, Staffordshire, jobbing smith, for certain improvements in locks and latches. Sealed 15th April —6 months for inrolment.

William Wylam, of Gateshead, merchant, for certain improvements in hydraulic presses, and in machinery connected therewith. Sealed 15th April—6 months for inrolment.

John Lord, of Friday Bridge, in Birmingham, merchant, for improvements in supplying steam-boilers with water,—being a communication. Sealed 15th April—6 months for inrolment.

John Taylor, of the Adelphi, Gent., for improvements in separating metals from each other, and from certain combinations with other substances,—being a communication. Sealed 15th April —6 months for inrolment.

John Felton, of Bolton Percy, near Tadcaster, Station Master, for improvements in wafers, and in the means of securing letters and notes from being surreptitiously opened. Sealed 15th April—6 months for inrolment.

James Muspratt, of Liverpool, Gent., for improvements in the manufacture of manure,—being a communication. Sealed 15th April—6 months for inrolment.

Moses Poole, of Serle-street, London, Gent., for improvements in the construction of taps or cocks,—being a communication. Sealed 15th April—6 months for inrolment.

Henry Phillips, of Clist, Honiton, Devonshire, chemist, for improvements in purifying gas. Sealed 15th April—6 months for inrolment.

James Williamson Brooke, of Bagnigge Wells Road, Gent., for improvements in lamps. Sealed 15th April—6 months for inrolment.

Charles Black, of Adam-street, Adelphi, Gent., for improvements in the manufacture of horse-shoes. Sealed 15th April—6 months for inrolment.

George Royle, of Church Hill, Wednesbury, Staffordshire, whitesmith, for improvements in locomotive, marine, steam, gas, and other tubes. Sealed 17th April—6 months for inrolment.

Hypollite Chanvier, of the City of London, Gent., for improvements in the manufacture of soap. Sealed 17th April—6 months for inrolment.

James Startin, of Finsbury-place, Gent., for improvements in boiling liquids, applicable to many purposes of domestic use, and particularly to tea or table urns. Sealed 17th April—6 months for inrolment.

Samuel Wilkinson, of Balloon-street, Leeds, mechanic, for a certain machine to be called a patent washing, wringing, and mangling machine. Sealed 17th April—6 months for inrolment.

William Peter Piggott, of Wardrobe-place, Doctors' Commons, mathematical instrument maker, for certain improvements in mathematical, nautical, optical, and astronomical instruments; and also in the mode of manufacturing dials and other graduated plates. Sealed 17th April—6 months for inrolment.

William Shepherd, of Manchester, calico printer, for certain improvements in the art of printing calicoes and other surfaces. Sealed 19th April—6 months for inrolment.

James Ivers, of Preston, Lancashire, machine maker, for certain improvements in machinery or apparatus for preparing, roving, and slubbing cotton, wool, and other fibrous substances. Sealed 22nd April—6 months for inrolment.

John Thomas Perkins, of Monmouth-street, pattern card maker, for certain improvements in machinery or apparatus for cutting paper and other fabrics. Sealed 22nd April—6 months for inrolment.

William Mackie, of Baggot-street, Dublin, builder, for improvements in window sashes, and in fastenings for window sashes and shutters. Sealed 22nd April—6 months for inrolment.

Charles Robert Roper, of Hackney, chemist, for improvements in the manufacture of gelatine. Sealed 22nd April—6 months for inrolment.

Charles Matthew Barker, of Manor-place, Walworth, Gent., for improvements in the manufacture of matches for obtaining instantaneous light; part of which improvements are applicable to sawing wood for other purposes. Sealed 22nd April—6 months for inrolment.

Alphonse le Mire de Normandy, of Dalston, in the county of Middlesex, Gent., for improvements in dissolving lac and shellac, and in rendering fabrics waterproof. Sealed 22nd April —6 months for inrolment.

Thomas Moss, of Gainford-street, Barnsbury-road, engraver, for improvements in printing and preparing bankers' notes, cheques, and other papers, for the better prevention of fraud. Sealed 22nd April—6 months for inrolment.

Freeman Roe, of the Strand, engineer, for improvements in the manufacture of pipes, for conveying water and other fluids. Sealed 22nd April—6 months for inrolment.

Charles Louis Mathurin Fouquet, of Jermyn-street, Haymarket, Gent., for improvements in the preparation of an artificial vegetable gum, to be used as a substitute for gum senegal. Sealed 22nd April—6 months for inrolment.

Robert Beart, of Godmanchester, Gent., for improvements in the manufacture of bricks and tiles. Sealed 24th April—6 months for inrolment.

Joseph Maudslay and Joshua Field, of Lambeth, engineers, for certain improvements in propelling, and in propelling machinery. Sealed 24th April—6 months for inrolment.

CELESTIAL PHENOMENA FOR MAY, 1845.

D.	H.	M.	
1			Clock after the sun, 3m. 3s.
—			☽ rises 2h. 16m. M.
—			☽ passes mer. 8h. 5m. M.
—			☽ sets 2h. 5m. A.
3	1	16	♅ in conj. with the ☽ diff. of dec. 4. 50. S.
4	6	9	♃ in conj. with the ☽ diff. of dec. 4. 3. S.
5	17	35	♀ in conj. with the ☽ diff. of dec. 2. 3. S.
			Annular eclipse of the sun, partially visible at Greenwich
	20	31	Begins } Mean time at Greenwich.
	21	36	Greatest Phase
	24	47	Ends
			Magnitude of the eclipse, (sun's dia. = 1.) 0·386, on the Northern limb.
6	5	5	☿ in conj. with the ☽ diff. of dec. 0. 8. S.
	9	58	Ecliptic conj. or ● new moon
	12	15	Pallas in □ with the ⊙
7	19	5	☿ in the descending node
8			☿ Tran. ⊙ part visible at Greenwich
	4	19	First contact } Mean time at Greenwich.
	7	35	Least distance, 9. 11.
	10	50	Last contact
	7	53	☿ in inf. conj. with the ⊙
	22	51	♄ in □ with the ⊙
9	9	2	☿ in conj. with ♀ diff. of dec. 0. 16. N.
			Occul. *X*1, Orionis, im. 8h. 42m.
			Occul. *X*2, Orionis, im. 9h. 6m.
	10	48	♂ in conj. with Pallas
10			Clock after the sun, 3m. 48s.
—			☽ rises 7h. 10m. M.
—			☽ passes mer. 3h. 13m. A.
—			☽ sets 11h. 11m. A.
	2		☽ in Apogee
12	9	49	Juno in □ with the ⊙
13			Occul. *k* Cancri, im. 7h. 31m.
14	2	9	☽ in □ or first quarter
15			Clock after the sun, 3m. 54s.
—			☽ rises 0h. 27m. A.
—			☽ passes mer. 7h. 0m. A.
—			☽ sets 1h. 0m. M.
16			Occul. *e* Leonis, im. 7h. 38m.
17			Mercury R. A. 2h. 47m. dec. 13. 35. N.
—			Venus R. A. 3h. 38m. dec. 19. 0. N.
—			Mars R. A. 20h. 35m. dec. 19. 37. S.
—			Vesta R. A. 2h. 9m. dec. 7. 33. N.
—			Juno R. A. 9h. 39m. dec. 12. 26. N.
—			Pallas R. A. 20h. 40m. dec. 15. 19. N.
—			Ceres R. A. 22h. 22m. dec. 19. 12. S.
—			Jupiter R. A. 1h. 40m. dec. 9. 13. N.
—			Saturn R. A. 21h. 26m. dec. 16. 2. S.
—			Georg. R. A. 0h. 33m. dec. 2. 54. N.
—			Mercury passes mer. 23h. 8m.
—			Venus passes mer. 59h. 59m.
—			Mars passes mer. 17h. 14m.
—			Jupiter passes mer. 21h. 57m.
—			Saturn passes mer. 17h. 43m.
—			Georg. passes mer. 20h. 50m.
	22	41	☿ in Aphelion
19			Occul. A. S. C. 1610, im. 7h. 14m. em. 7h. 56m.
20			Clock after the sun, 2m. 45s.
—			☽ rises 6h. 44m. A.
—			☽ passes mer. 11h. 16m. A.
—			☽ sets 3h. 3m. M.
			Occul. *i*1, Libra, im. 8h. 12m.
	13	53	☿ stationary
21			Occul. *u* Ophiuchi, im. 15h. 59m.
21			☽ Eclipsed, invis. at Greenwh.
	8	58	Ecliptic oppo. or ○ full moon
22	6	39	Ceres in □ with the ⊙
			Occul 2, Sagittarii, im. 16h. 8m. em. 17h. 9m.
	7		☽ in Perigee
25			Clock after the sun, 3m. 23s.
—			☽ rises 11h. 27m. A.
—			☽ passes mer. 3h. 23m. M.
—			☽ sets 8h. 3m. M.
26	9	52	♂ in conj. with the ☽ diff. of dec. 8. 13. S.
	15	6	♄ in conj. with the ☽ diff. of dec. 6. 31. S.
27			Pallas stationary
28	5	23	♀ in the ascending node
	6	25	☽ in □ or last quarter
29	15	5	♄ stationary
30	9	36	♅ in conj. with the ☽ diff. of dec. 4. 46. S.
31	23	22	♃ in conj. with the ☽ diff. of dec. 3. 33. S.

J. LEWTHWAITE, Rotherhithe.

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No. CLXII.

RECENT PATENTS.

To HENRY COOPER, *of Royton, in the county of Lancaster, cotton manufacturer, for certain improvements in machinery or apparatus to be used for doubling cotton, worsted, and other fibrous materials.*—[Sealed 12th September, 1844.]

THESE improvements in machinery or apparatus to be used for doubling cotton, worsted, and other fibrous materials, apply to the machines usually called or known by the name of "twining jennies," and consist in certain modifications in the arrangements of the apparatus, whereby an ordinary "jenny," with very little alteration, and at a very small cost, may be made to produce about double the usual amount of thread; thereby effecting a considerable saving, both in the space occupied by the machinery, and also in the cost of the apparatus. It is also stated, that several other advantages, evident to the practical spinner, will be derived from the application of this invention.

The drawings in Plate XIII., represent a portion of a twining jenny, with the improvements applied; fig. 1, being a plan or horizontal view, as seen from above, and fig. 2, a transverse section of the same. In jennies of the ordinary construction, the cops of yarn *a, a,* to be doubled, are placed on wooden pins or skewers, mounted in the creel *b, b,* fixed to the carriage *c,* which travels on a railway *d,* at each end of the machine, and is supported, at suitable intervals, by the wheels *e, e,* bearing on railways *f, f.* The threads from these cops *a, a,* pass through guides, over the rails *g, h,* and *i,* and between the rails *k,* and *l,* to the spindles *m,* mounted in the spindle-rails *n, n,* which are caused to revolve by bands passing around the drum *o,* connected to the self-acting headstock (the main framing *p, p,* of which, is alone shewn, as the operation of a self-acting headstock is too well known to need description); the whole being actuated by a band passing around the driving-pulley *q.*

The motions of the machinery are as follow :—The carriage *c, c,* is caused to recede from the spindles *m,* and give out a certain amount of yarn to be doubled from the cops *a, a,* which revolve loosely in the creel *b, b.* At the same time the spindles *m,* revolve, and double or twist the yarn as it is given out. The top rail *k,* is now brought down, and holds the threads firmly between it and the bottom rail *l;* the few coils on the upper part of the spindles are then "backed off," and the carriage commences to return; the spindles still revolving and "winding on" the yarn, which has been doubled, it being guided upon the spindle, so as to form a cop, by the faller and counter-faller wires *r, r.* The top rail *k,* is then raised, and the threads released, when the carriage *c,* again commences going out, and the operation proceeds as before.

Having described the machinery in general used for doubling cotton and other fibrous materials, together with its mode of operation, the patentee proceeds to shew the application of his improvements thereto, which consist chiefly in having an additional row of spindles *s, s,* mounted in corresponding spindle-rails *t, t,* opposite to the spaces between the spindles *m,* (see plan view, fig. 1,) for which, of course, an additional faller and counter-faller *u, u,* will be required. A creel, of a novel construction, is also employed, consisting of four rails *v, v,* in which the cops are mounted; but the old creel *b, b,* is used when the cops are nearly wound off, as it will be found that the yarn then winds off best in a horizontal direction, or nearly so. The motion of both sets of fallers and counter-fallers being precisely the same, no additional gearing is required, except a pair of small carrier-pinions to connect them together: the additional spindles *s*, *s*, can also be driven from the same drum *o*, as the spindles *m*.

The patentee claims the employment, application, or use, of an additional row of spindles in common "twining jennies," with their corresponding faller and counter-faller, whether in connection with a self-acting headstock, or otherwise, in the operation of doubling cotton, worsted, and other fibrous materials, for the purpose of effecting double the amount of work (or thereabouts) usually performed by such machines.—[*Inrolled in the Petty Bag Office, March,* 1845.]

Specification drawn by Messrs. Newton and Son.

To JEAN BAPTISTE PAUL CHAPPÉ, *of Manchester, in the county of Lancaster, spinner and doubler, for his invention of certain improvements in machinery or apparatus for spinning and doubling cotton and other fibrous substances.*—[Sealed 17th October, 1844.]

THESE improvements in machinery or apparatus for spinning and doubling cotton and other fibrous substances, consist in a novel arrangement of mechanism for spinning or doubling direct from the delivering-rollers to the spindle point, without the necessity of a thread-board, guide, or any other contrivance; and also in winding the yarn on the bobbins, without the friction on the head of the bobbin, caused by the ordinary flyer used for such purposes: this is effected by having a curl at the top and bend of the flyer, forming a direct line to the drawing or delivering-rollers (the spindles being sufficiently raised to prevent the yarn dragging on the delivering-roller); which alteration is the only mechanical contrivance required, as a reference to Plate XIV., will fully explain.

Fig. 1, is a sectional elevation of a spinning throstle, and fig. 2, a similar view of a doubling machine. The spindles are shewn at *a*, *a*, with the improved flyer applied thereto;

b, b, is the flyer, with its guides *c, c, c;* which peculiar arrangement (in place of the common guide-board) constitutes the improvement, and is also shewn, on an enlarged scale, at fig. 3.

The object of this invention, as before stated, is to bring the twist or turns direct from the spindles to the bite of the delivering-rollers; removing the interruption caused by the friction and angle formed by the thread-board, in the throstles generally used, and on the top of the bobbin; and giving the turns immediately at the delivering part of the rollers; thereby removing the difficulty of spinning fine counts, or numbers, and soft yarn, on throstles. It is also equally applicable to doubling-frames; the only mechanical contrivance required, as above mentioned, being a small curl on the top of the flyers, about half an inch high, and one on the bend; the spindles being raised sufficiently to give an easy inclination to the spinning or doubling-threads from the rollers to the top of the spindles.

The patentee states, that he does not confine himself to curls, as the same object may be effected by an eye, hook, or other similar contrivance. He claims spinning or doubling direct from the drawing or delivering-rollers to the spindle, as in the mule; and winding the yarn or double thread on the bobbins with less friction, and thereby enabling fine counts or numbers, and soft yarn, to be spun on throstles.—[*Inrolled in the Petty Bag Office, April,* 1845.

Specification drawn by Messrs. Newton and Son.

To John Groom, *of Oldham, in the county of Lancaster, mechanic, for certain improvements in machinery or apparatus for preparing, slubbing, and roving, cotton, wool, and other fibrous substances.*—[Sealed 7th November, 1844.]

These improvements apply to the ordinary machinery used for preparing, slubbing, and roving; and particularly to that part of the same called the "flyer." It is well known, that the flyers employed for winding the sliver of cotton, &c., on to the bobbin, in slubbing and roving machines, have been varied in their construction; and that those in most general use are denominated the "presser flyer;" so called in consequence of one arm of the flyer being provided with a small presser-lever or guide, for the purpose of laying the sliver in a firm and compact state upon the bobbin. In machinery of this description, it is a most desirable object to cause the spindle to revolve with a regular steadiness throughout the entire formation of the bobbin of rovings; but with the common presser-flyer this is not attainable; for, as the roving accumulates on the bobbin, its increased diameter destroys the equilibrium of the spindle and flyer; and the greater the expansion of the "presser-lever," the more unsteady the spindle becomes: this great defect arises simply from the presser-lever being in connection with one arm of the flyer only.

Now, these improvements consist in connecting the action of the presser-lever with both arms of the flyer, in such a manner as to effect the following advantages: first,—the required steadiness of the spindle and flyer throughout the entire formation of the bobbin of roving or slubbing; secondly,—an equality of pressure during the complete formation of the same; the roving or slubbing not being slightly wound at the commencement and tightly compressed at the completion of the bobbin, as in former "presser-frames;" and, thirdly,—a facility of "doffing" or removing the bobbin when full, or for "piecing up," which has not hitherto been obtained.

These improvements will be readily understood by reference to Plate XIII.; in which, fig. 1, is a side, and fig. 2, a front elevation of the improved spindle and flyer, as employed in roving-frames for cotton; and fig. 3, is a plan or horizontal view of the flyer. *a*, is the spindle; *b*, *b*, the flyer, one arm of which is formed solid, and the other tubular, for the passage of the rovings; and *c*, is the common presser-lever or guide, for winding the roving on to the bobbin *d*, compactly.

It will be seen, that this invention consists simply in giving the pressure to the presser-lever or guide *c*, by means of the semi-circular or bow-spring *e*, *e**, instead of the straight spring, commonly attached to one arm of the flyer; and also that this pressure is given in a much more effective manner by the bow-spring, in consequence of one end, *e**, of it being made fast to the one arm of the flyer, whilst the other end *e*, is acting or exerting its elastic force or pressure on the tail or end *f*, of the presser-lever, which swivels or turns upon the circular lower part of the arm of the flyer; the presser-lever being provided with a short tube or bearing *g*, for this purpose. When it is required to doff or remove a full bobbin, or to piece up, or repair it in any way, the presser-lever *c*, has only to be turned back out of the way, as shewn by dots in fig. 3, where it will be held also by the action of the bow-spring *e*.

A second part of this invention consists in combining the spring (of whatever form) with the presser-lever, that is, forming them of one piece only, as represented in fig. 4.

The patentee claims, Firstly,—the application, employment, and use, of a semi-circular, or bow-spring, to the ordinary presser-flyer, used in machinery or apparatus for preparing, slubbing, and roving cotton, wool, and other fibrous materials; one end of the said spring being attached to the one arm of the flyer, and the other end to the tail or shorter end of the presser-lever. And, Secondly,—the presser-lever and its actuating spring being made or formed of one piece only.—[*Inrolled in the Petty Bag Office, May*, 1845.]

Specification drawn by Messrs. Newton and Son.

To THOMAS SQUIRE, *of Warrington, in the county of Lancaster, tanner, for improvements in tanning hides and skins.*—[Sealed 29th October, 1844.]

THIS invention consists in the employment of a slowly revolving open frame or drum, divided into compartments, which receive the hides or skins to be tanned; so that they will be slowly, but constantly, changing their positions in the tanning liquor, in which the drum is immersed.

A transverse vertical section of the apparatus is exhibited in Plate XIII. The drum *a*, is about seven feet in diameter, and is divided into four compartments by the staves or bars *b*, *b*; each compartment having a door *c*, for the admission of the hides or skins. The axis *d*, of the drum turns in suitable bearings in the sides of the vat or tan-pit *e*, (shewn by dotted lines), which is deep enough to admit of the drum being entirely immersed in the tanning liquor. In this pit the drum is caused to revolve at the rate of one revolution in from two to three minutes. If preferred, however, the drum may be immersed only up to its axis, and then the hides or skins will be alternately immersed in the liquor, and exposed to the atmosphere.

The patentee says he is aware that it has been proposed to use barrels, with perforated sides, revolving at a considerable speed, so as, by centrifugal force, to cause the hides or skins to be pressed outwards, and compressed;—the momentum throwing off the liquor from the hides or skins so treated, and the liquor being pumped over the outer perforated surface, or into the ends of the barrel, which was situated above a cistern. He does not, therefore, claim the use of revolving apparatus, containing hides or skins, generally; but only when constructed and worked in the manner herein described, whereby the hides or skins, under process (by their positions in the tanning liquor being constantly, yet slowly, changed), are tanned without violence or forcible pressure.—[*Inrolled in the Inrolment Office, April,* 1845.]

To Frederick Ransome, *of Ipswich, caster, for improvements in the manufacture of artificial stone for grinding and other purposes.*—[Sealed 22nd October, 1844.

This invention consists, firstly, in manufacturing artificial stone, by cementing broken or pulverized stone, sand, or earthy or metallic matters, with a solution of silica; and secondly, in subjecting the artificial stone, formed in this manner, to hydraulic or other mechanical pressure, in moulds.

The solution of silica or siliceous cement is made, by preference, in the following manner; but the patentee does not confine himself to this mode of preparing it:—100 lbs. of crystallized carbonate of soda are dissolved in 50 gallons of water, and the soda is rendered caustic, by the addition of lime; or, instead of carbonate of soda, 50 lbs. of carbonate of potash are dissolved in the requisite quantity of water, and the potash rendered caustic, as above mentioned. The caustic alkaline solution is reduced, by heat, to 20 or 25 gallons; it is then put into an iron boiler, or digester, with 100 lbs. of finely broken flints, or other siliceous substance, and the mixture is heated, during ten or twelve hours, up to a pressure of about 60 lbs. to the square inch (being frequently stirred during that period); after which, it is removed from the digester, and passed through a sieve, to separate any undissolved stone from it. The cement is now ready for use; or may be brought to any required consistence by the admixture of sand, or finely powdered flints; or it may be thinned by the addition of water.

Mill-stones are made, according to this invention, by mixing together 1 part of siliceous cement, 1 part of powdered flint, or powdered pipe-clay, and 3 or 4 parts of fragments of burr, or other suitable stone; this compound is subjected to mechanical pressure, in iron moulds, and, after being removed therefrom, is allowed to dry, at the ordinary temperature of the atmosphere, for twenty-four hours; it is then placed in an oven or drying-room, where the temperature is gradually raised to that of boiling water, and the stone is thus effectually dried. When artificial stone, for other purposes, is to be manufactured, a mixture is made of granite, common sand, or fragments of any siliceous or other hard stone or substance, with from one-fourth to one-sixth of the siliceous cement; and it is treated in the same way as that above described.

By reducing the stone or other material to very fine particles, previous to adding the siliceous cement thereto, more or less fluid mixtures may be produced, for coating walls or other surfaces.

The patentee claims, Firstly, the mode of manufacturing artificial stone, for grinding and other purposes, by cementing broken or pulverized stone, sand, or earthy or metallic matters, with a solution of silica. And, Secondly, subjecting artificial stone, produced by the aid of a solution of silica with broken or pulverized stone, sand, or earthy or metallic matters, to hydraulic or other mechanical pressure, in moulds.—[*Inrolled in the Inrolment Office, April,* 1845.]

To SAMUEL PRITCHETT, *of Charlbury, in the county of Oxford, glove-maker, for certain improvements in cutting and making-up gloves.*—[Sealed 3rd October, 1844.]

THIS invention consists in certain novel methods of cutting or shaping a glove out of a skin or other material; whereby, when the glove is made up, some of the ordinary seams may be dispensed with, and consequently the glove will be less liable to become unsewn. The principal seams dispensed with are those at the side, which are exceedingly liable to become unsewn, and are also considered unsightly. By the improved methods of cutting out, the seam which closes the glove, and answers the purpose of the side seam, is thrown to the inner or palm part of the hand, and is conducted from the junction of any two fingers either to the thumb seam or to the button slit. The patentee prefers to conduct the seam from the junction of the index and middle finger to the thumb seam, as seen in Plate XIV., fig. *2*; but it may also be brought from between the second and third, or third and fourth fingers, to the button slit, as shewn by dots at E, and F, in the same figure.

Gloves made according to this invention will also consist of fewer pieces than usual, as, in some cases, the detached parts called "fourchettes" and "quirks" are dispensed with, and, in place thereof, the patentee leaves on or cuts out with the principal or hand part of the glove, certain portions in connection with the fingers, which, when sewed together, answer precisely the same purpose. He sometimes, however, employs one or more fourchettes of a peculiar form; but then he dispenses with the quirks, as certain parts, to supply their places, are either cut out with and form a portion of the fourchettes, or the hand part of the glove. The peculiarly-shaped fourchette which he prefers, and therefore wishes to claim, is that shewn at C, fig. 1.

Fig. 1, represents one method of cutting out a glove, so as to dispense with the side seams; and fig. 2, represents the glove complete. The part A, fig. 1, forms the principal or hand part of the glove. In this instance the ordinary side-seams are dispensed with; a closing seam being made in the palm of the hand, between the index and middle finger, as before mentioned, and as seen in the complete glove at G, fig. 2. Fourchettes of a peculiar form are employed, combining the fourchette and the quirk together. Two fourchettes of different forms are shewn at B, and C, fig. 1. Fourchettes of a longitudinal form, somewhat similar to the one shewn at B, have been heretofore used; the peculiarity of this fourchette being the addition of the projecting part *b*, which acts as a quirk, and takes the strain off that part of the seam which would otherwise be liable to break away from the stitches. The peculiar form of the fourchette C, will be so evident, from an inspection of the drawings, that it will require no further description.

In order to shew more clearly the manner in which the different parts are brought together, corresponding parts are marked with similar figures.

Figs. 3, and 4, represent a mode of cutting out and making up a glove, in which the side seams, and also the detached fourchettes, are dispensed with; certain fly-pieces *a, a,* to answer the same purpose as fourchettes, being cut out with the body of the glove, as shewn at figs. 3. The inner part of the third finger is cut out separately, as seen at D; the fly-pieces to form the sides of the finger being also cut out with and forming part of it.

Fig. 5, represents another method of cutting out a glove, so as to dispense with the side seams. The closing seam in this instance is placed at the back of the hand, and runs up one of the points; it will not, therefore, be visible, except at the wrist-end of the glove, where the patentee proposes to hide it, by covering it over with a plain or ornamental piece of leather, or other material. The fourchette recommended for this glove is that shewn at C, fig. 1; but the other one, B, may be employed, or these detached portions may be altogether dispensed with, by adopting a plan of cutting similar to that shewn at fig. 3.

Fig. 6, represents another mode of cutting out a glove. This glove has the ordinary side seam, but only one fourchette is used, viz., the one between the third and fourth finger; the inner side of the second or middle finger is also formed by a detached piece D; the pieces to supply the place of the fourchette being cut out with the piece D, as in figs. 3, and 4.

In all the above described methods, the thumb-pieces are cut separate from the hand part of the glove, in the ordinary manner; but in figs. 7, and 8, is shewn a plan of cutting out a glove with the thumb in connection with the main-piece. By this means the entire glove is cut out in two pieces only, and several seams are dispensed with. The inner side of the third finger is formed by a detached piece, with fly-pieces, as at D, in the former figures. The dotted lines, in all the figures, represent the places where the leather is folded over to complete the glove.

The patentee claims, Firstly,—cutting out and making-up gloves, in such a manner as to bring the closing seam either to the palm of the hand, (as seen at figs. 1, 2, 3, 4, 7, and 8,) or to the back, (as at fig. 5,) so as to obviate the necessity of making side seams. Secondly,—the peculiar form of fourchettes, shewn at B, and C, in fig. 1. And, Thirdly,—the various plans, above shewn and described, whereby several of the seams which are generally made in gloves are dispensed with.—[*Inrolled in the Petty Bag Office, April,* 1845.]

Specification drawn by Messrs. Newton and Son.

To WILLIAM NEWTON, *of the Office for Patents,* 66, *Chancery-lane, in the county of Middlesex, civil engineer, for certain improvements in the manufacture of wire from zinc, and the application of the same to various useful purposes,—being a communication.*—[Sealed 10th July, 1844.]

THE principal object of this invention is the manufacture of wire from zinc, which is effected in the following manner:—A plate or sheet of zinc, of about the same thickness as the wire intended to be produced, is cut into strips or rods, by means of the ordinary shears or apparatus used for slitting or cutting-up iron; or the rotary cutters, hereafter described, may be employed. These strips are cut off in widths equal to the thickness of the metal plate, so as to form square rods, which are rounded, by passing them between grooved rollers, and are then passed through the draw-plate; or they may be conducted direct to the draw-plate, without employing the grooved rollers. The inventor prefers to perform these operations without the employment of heat. When wire of great length is required, the circular cutters, hereafter described, and which form an integral part of this invention, are employed.

In Plate XIII., fig. 1, is a plan view of the machine employed for cutting the zinc into long strips; fig. 2, is a side elevation; and fig. 3, a transverse section, taken in the line A, B, of fig. 1. *a, a*, is the frame-work, of cast-iron; *b*, and b^1, two iron shafts; *c*, c^1, two steel discs, or cutters, mounted on the shafts *b*, b^1; and *d*, an iron screw.

The shafts *b*, b^1, are mounted in bearings in the frame-work, parallel to each other, and are connected together by cog-wheels *e, e*, of equal diameter. The shaft *b*, is furnished, at one end, with fast and loose pulleys *f*, and f^1, and at the other end the steel disc *c*, is mounted. Another steel disc c^1, is mounted, in a similar manner, on the shaft b^1. This shaft b^1, carries a second cog-wheel *i*, which communicates motion, through the cog-wheel *j*, intermediate shaft *g*, and cog-wheels *n*, and n^1, to the screw *d*. *h*, is a nut or guide, which slides upon the table *k*, of the frame-work, and is for the purpose of supporting and guiding the sheet of zinc to be cut; it has a round knob or projection at the top, which enters a hole, pierced in the centre of the sheet.

The action of the machine is as follows:— Supposing motion to be communicated to the shaft *b*, by means of the driving-pulley, the shaft b^1, will be caused to turn in a contrary direction, and thus the rotary cutters *c*, and c^1, will be made to revolve in opposite directions. The screw *d*, will also turn on its axis, and thereby cause the guide *h*, carrying the sheet of metal, to advance towards the cutters, at a speed regulated by the intended width of the strip of metal; and the vertical cutters, turning in contrary directions, will cause the horizontal sheet of metal to move round upon its centre, while they cut off a strip, which is then wound upon the conical drum or barrel *m*, at the side of the machine. Motion is communicated to the drum *m*, by means of a small chain passing round a cog-wheel *l*, upon the shaft b^1, and from thence to another cog-wheel *o*, mounted loosely upon the drum-shaft, and causing it to turn by friction of contact: this arrangement is necessary, in order to prevent the zinc from breaking, on any sudden strain, arising from a variation in the speed of the machine. The width of the strips is varied, by changing the two small cog-wheels *n*, n^1, severally fixed upon the intermediate shaft *g*, and screw *d*.

The screw-guide *h*, is made in two parts, in order to facilitate its removal from the screw *d*, and save time, by preventing the necessity of turning the screw in a contrary direction for some length of time, when it is necessary to move it back to any required distance from the cutters.

Instead of the wheels *n*, n^1, two cones, with driving-bands, may be employed; in order to vary the speed of the screw, as the diameter of the sheet diminishes, without putting any part of the machine out of gear.

Zinc wire may also be produced, by first passing rods of zinc, previously formed by casting, between grooved rollers, in a heated state; and when they have been sufficiently operated upon by the rollers, allowing them to cool; and passing them, in a cold state, through the draw-plate, in the manner above mentioned.

The zinc wire may be employed for the manufacture of metallic cloths or tissues, lattice-work, &c., in the same manner as other metallic wire. It may also be used for making hooks and eyes, and other fastenings for wearing apparel, for ropes and cables, for fastenings for bottles containing aerated water or other effervescing liquids; or it may be covered with paper, or other suitable substance, and used by milliners or artificial flower-makers; it may also be employed in horticulture, &c.

The patentee claims, Firstly,—the methods, above described, of manufacturing zinc wire, either by casting into bars or rods, and then rolling it down, and afterwards drawing it; or by cutting it into strips, and then submitting it to the operation of drawing; and also the arrangement of rotary cutters, for cutting the zinc into strips, as above described. Secondly, —the application of zinc wire to the various purposes above set forth, such as the manufacture of metallic fabrics, trellis-work, hooks and eyes, or other fastenings, and other similar purposes.—[*Inrolled in the Petty Bag Office, January,* 1845.]

Specification drawn by Messrs. Newton and Son.

To Henry Walker Wood, *of Chester-square, Middlesex, Gent., for an improvement in producing an uneven surface in wood and other substances,—being a communication.*—[Sealed 25th November, 1840.]

This improvement in producing an uneven surface in wood and other substances, consists of a new combination or the application of hot moulds or dies to the surface of wood or other combustible substance, to be rendered uneven or of an uneven form on the surface, in order to remove from the surface all extraneous matter not required to form the uneven part of the surface or object, so that a charred or burnt appearance shall not appear upon the uneven surface produced on the wood or other combustible substance. The new combination is produced as follows:—a model of the object or figure to be produced on the surface of the wood or other substance, is first made, and from this model a matrix or reverse mould is taken; a cast in hard metal of the matrix is then carefully produced. This mould or die, having the reverse model of the object or figure to be produced, either in one or more pieces, is placed in an ordinary furnace, for the purpose of being heated; when red hot, the mould or die is brought out of the furnace, and placed under a press; a piece of wood, or other substance to be operated upon, is placed upon the hot mould or die, and they are immediately pressed smartly together; but it may be done by putting the wood or substance below, and letting down the mould or die quickly upon it, allowing a short time for the combustion to take place: care must be taken to perform this part of the operation with great quickness, otherwise the expansion of vapour or gaseous matter will tear and split the work. The press is now suddenly raised, and the article thrown into water, or other liquid; it is then carefully cleaned, by scraping or brushing away the burnt parts; and the operation is repeated a considerable number of times, until the design is produced in a perfect manner. The number of pressures required depends principally upon the depth of the matter to be removed; and the operation is again and again repeated, until the object or figure is satisfactorily completed. In some cases it will be found unnecessary to throw the article after each pressing into a liquid, and then the burnt parts are removed by scraping and brushing only; but, in general, it is preferred to throw the article into cold water immediately after it has received the pressure. The work is placed in racks to dry slowly; and, when dry, it may be gilt, varnished, oiled, or painted, or otherwise treated, according to the purpose for which it has to be applied.

The patentee claims the above described combination of means or mode of producing any uneven surface, or object, or figure, upon wood or other combustible substance, by repeated contact with hot moulds or dies, operating against the wood or other combustible substance, in the manner above mentioned.—[*Inrolled in the Petty Bag Office, May,* 1841.]

To JAMES VIBART, *of Chilliswood House, near Taunton, in the county of Somerset, Lieut. R.N., for certain improvements in the means of obtaining and applying power for working or driving thrashing machines, mills, chaff-cutters, and other machines or apparatus.*—[Sealed 12th September, 1844.]

THIS invention consists in the application of the principle of the lever, in the construction of an engine or machine for obtaining motive power, for driving agricultural and other machines; and which machine is proposed to be mounted on wheels or rollers, to facilitate its transportation from one place to another. In Plate XV., fig. 1, represents a side elevation; and fig. 2, an end view of the engine. It consists of a strong wooden or iron framing *a, a,* carrying a horizontal crank-shaft *b,* in bearings *c, c,* which are furnished with small anti-friction rollers, for the purpose of reducing the friction of the shaft *b;* one end of this shaft carries a large fly-wheel *d,* and at the other end the band or driving-wheel *e,* is mounted. *f,* is a lever, having its fulcrum at *g;* it is connected at one end, by means of the rod *h,* to the crank of the shaft *b,* and at its opposite extremity to the lower end of the vertical rod *i,* which is moved up and down in the bearings *j, j,* by means of the vibrating arms or levers *k, k.* These arms have their fulcrum at *l,* and are connected to the vertical rod *i,* by chains or straps *m.* The engine is mounted on four wheels; and, if required, the speed at which it drives machinery may be considerably increased, by the employment of additional speed gearing, consisting of a large toothed wheel *n,* mounted on the crank-shaft *b,* and gearing into a pinion *o,* on the shaft *p;* this shaft also carries a band-wheel to be used for driving thrashing or other machinery, in place of the band-wheel *e,* which has a slower motion.

Fg. 3, represents, in side elevation, a modification of the above; and fig. 4, is an end view: the arrangement of the several parts is somewhat different, but the principle and the effect produced are the same. *b,* is the crank shaft; and *h,* the connecting rod which transmits the vibrating motion of the lever *f,* to the crank-shaft. The vibrating levers *k, k,* are mounted at the end of the machine; and a bell-cranked lever *q,* is employed as an auxiliary power. The use and effect of this is so obvious that no further description thereof will be necessary.

Fg. 5, is a side elevation of a modification of the improved engine, adapted to thrashing machinery; and fig. 6, a detached view, on an enlarged scale, of an improved coupling, whereby another machine may be driven, either at the same time as a thrashing machine, or without driving or removing this latter. Motion is transmitted to the crank-shaft *b,* as in the other instances, by means of a pair of vibrating levers *k, k;* the lever *f,* in this case, having its fulcrum *x,* at one end, instead of at or near its centre. On the opposite side of the machine a toothed-wheel *r,* and pinion (see fig. 6,) are mounted, for the purpose of actuating and increasing the speed of the wheel-work *s, s,* which drives the thrashing-machine. The wheel *r,* turns freely on the crank-shaft *b,* and is furnished with a clutch or coupling *t,* which, by being screwed tightly up against the boss *u,* of the crank-shaft, causes the wheel *r,* to be carried round with it, when required to drive the thrashing-machine; but when the latter is to be detached, this object is effected by loosening the screw-bolts, and causing the clutch *t,* to recede from the boss *u,* and then this latter will revolve freely, without carrying round the toothed-wheel *r,* with it. An additional toothed-wheel, or a band-wheel, or a universal joint and coupling, must be keyed into the shaft, for the purpose of driving other machinery when required.

Fig. 7, is a side elevation of another modification of the improved hand motive power. The rotary motion of the main-shaft is obtained in this machine, also, by means of vibrating levers, which are keyed into a double bell-crank, the middle arm of which transmits motion to the crank-shaft *b,* by means of a connecting rod, as in the other machines; and when a more powerful machine is to be impelled, another crank is put on the shaft *b,* on the opposite side of the machine, and is actuated irr a similar manner, either by means of one vibrating lever, or two, according to the power required.

The patentee says he is aware that thrashing-machines and other agricultural implements have been heretofore driven or actuated by means of levers;—he does not, therefore, mean to claim that as constituting his invention, except as hereinafter mentioned; but he claims constructing engines or machines for driving or working agricultural and other machinery; which engines or machines consist of an arrangement of levers, such as above described; and which engines are capable of being disconnected or detached from any machines to which they may have been temporarily applied, and may be employed for driving other machinery.—[*Inrolled in the Petty Bag Office, February,* 1845.]

Specification drawn by Messrs. Newton and Son.

To John Aitken, *of Surrey-square, in the county of Surrey, Gent., for improvements in atmospheric railways.*—[Sealed 24th February, 1844.]

These improvements consist, firstly,—in obtaining the requisite vacuum in the traction-pipes of atmospheric railways, by filling them with water, and then, by means of eduction-pipes (from thirty-two to thirty-three feet long, which descend from the traction-pipes, and have their lower ends immersed in water, or bent upwards), carrying off such water, leaving a better vacuum than can be conveniently obtained by air-pumps; or, in place of such length of eduction-pipes, shorter eduction-pipes, connected with pumps, may be used for withdrawing the water; secondly,—in rendering the longitudinal valve of the traction-pipe air-tight, by keeping it covered with water.

The traction-pipe is placed between the rails, in a trough, which is made sufficiently deep to admit of the water, contained therein, covering the pipe some inches. The longitudinal valve is constructed in the ordinary manner; and is either hinged or not to the traction-pipe, as may be preferred.

In Plate XIII., fig. 1, represents a transverse section of the pipe, in its trough; and fig. 2, a plan view of part of the pipe. *a,* is the traction-pipe; *b,* the longitudinal valve that closes the opening in the upper surface thereof; *c,* the trough; *d,* a transverse slide or valve; and *e,* the box in which it works.

On those parts of the railway which are horizontal, there will be no difficulty in keeping the trough full of water, from a stream, or, by means of pumps, from wells; and, in this case, it will only be necessary to employ valves *d,* at the extremities of such lengths of the traction-pipe as are to be rendered vacuous at one time; and where the vacuum is not required to be repeated at quick intervals, only one eduction-pipe would be required in a mile or greater length, as time may be allowed for running off the water, and obtaining the vacuum, before the carriages start. When the longitudinal valve is lifted, by the ordinary means, the pressure of the atmosphere forces the water into the traction-pipe, and the water and air press forward the piston, connected with the carriages; the water fills the traction-pipe behind the piston, and thus the pipe is left in a suitable condition to be rendered vacuous for the next carriage or train of carriages.

At those parts of the railway which are on an incline, provision must be made for preventing the water in the traction-pipe from opening the longitudinal valve; this the patentee prefers to effect, by placing the valves *d*, at such distances apart, as will give a pressure of not more than one foot of water between the highest and lowest point of the traction-pipe, between two such valves; and the longitudinal valve is made sufficiently heavy to resist the pressure. The upper surface of the longitudinal valve is kept covered with water, in this instance, by the water being supplied at the highest point, or at several points, constantly, and allowed to flow downwards; and when a sufficient supply of water cannot be got at the highest point, then the water is pumped back again from the lowest point. To ensure the correct working of the valves, the patentee proposes to transmit the required orders to the men on the line by means of electric telegraphs.

He claims the mode of constructing and working atmospheric railways, whereby water is used as a means of obtaining the necessary vacuum in the traction-pipes; and also for retaining the longitudinal valve air-tight, as above described.
—[*Inrolled in the Inrolment Office, August,* 1844.]

To JOHN AITKEN, *of Surrey-square, in the county of Surrey, Gent., for improvements in water-machines or engines, and steam-engines, and the mode of traction on or in canals, or other waters or ways.*—[Sealed 10th April, 1844.]

THIS invention is divided into five parts, and consists, firstly, in giving motion to the main shaft of dredging-machines, by means of an under-shot water-wheel or wheels, worked by the power of the tide, in place of the steam-engine hitherto employed.

The second part relates to machinery for raising stone or other heavy bodies. A tank or vessel, for containing water, is divided into two compartments, by a horizontal partition; upon which is fixed a cylinder, closed at each end, and furnished with a piston and valves, similar to the cylinder of a steam-engine; the piston-rod is connected, by suitable apparatus, with a windlass or barrel, which being caused to rotate, by the motion of the piston, winds up a rope or chain, and thus raises the stone. The induction ways of the cylinder communicate with the water in the upper part of the tank; and the eduction ways communicate with the lower compartment, wherein a partial vacuum is to be created, by raising the water therefrom into the upper compartment, by means of a pump, the plunger of which works below the level of the water in the lower compartment. The motion of the piston is produced in the following manner:—Supposing the piston to be at the upper part of the cylinder, and that a partial vacuum has been obtained, by pumping from the lower compartment of the tank a quantity of water equal to the contents of the cylinder,—then, if the valves be moved, so as to open the lower eduction way to the vacuum, and the upper induction way to the water in the upper compartment, the pressure of the atmosphere will cause the water to enter the cylinder through the upper induction way, and press the piston downwards with the force due to the state of vacuum in the lower compartment; and, by this means, the water beneath the piston will be forced through the lower eduction way into the lower compartment. Then, if a partial vacuum be again created in the lower compartment, by pumping water therefrom, and the valves be reversed, the pressure of the atmosphere will cause the water, in the upper compartment, to enter the cylinder through the lower induction way, and raise the piston; and the water above the piston will be forced through the upper eduction way into the lower compartment. If the piston be required to make two or more strokes in quick succession, the lower compartment of the tank must be large enough to contain as much water as will be given out in the desired number of strokes; and this quantity of water must be pumped out of the lower compartment, before the apparatus is put in motion.

The third part of this invention consists in a mode of supplying the condensing water to the condensers of steam-engines, and at the same time obtaining power thereby. A cylinder, closed at top and bottom, and furnished with suitable valves and a piston, is connected with the condenser, in the same manner as the cylinder, above mentioned, was connected with the tank; so that the water, in passing from the cold water cistern into the condenser, will give motion to the piston. The movement of this piston is communicated to the beam of the steam-engine, for the purpose of assisting the steam in giving motion to the beam; thus the engine will be relieved from the weight of water in the air-pump; as the water, in entering the condenser, produces sufficient power to take an equal quantity of water out.

The fourth part of this invention consists in drawing or towing vessels on canals, or other waters, by means of atmospheric pressure, acting against a vacuum produced by water, in the manner described under the present patentee's previous patent, for "improvements in atmospheric railways," February 24th, 1844.* A tube or traction-pipe, with a longitudinal opening in its upper surface, closed by a valve, is laid along the canal, a few inches below the surface of the water, as represented in the transverse section, fig. 3, (Plate XIII.), where *a*, is the traction-pipe; *b*, the longitudinal valve; *c*, one of the banks of the canal; *d*, a transverse slide or valve; and *e*, the box in which it works. A vacuum is produced in the traction-pipe, by withdrawing the water which it contains; and then the pressure of the atmosphere causes the water in the canal to enter the pipe, and force the piston onwards; by this means the canal-boat, which is connected by an arm with the piston, is drawn along, and the pipe is left in a suitable condition to be rendered vacuous for the next vessel. The patentee proposes to transmit the orders relative to opening and closing the valves *d*, by means of electric telegraphs.

The last part of this invention consists in employing the power of the tide as a means of giving motion to machinery for unloading or loading vessels with coals or other cargo.

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* For description of this Invention see *ante* p. 318.

This is proposed to be effected by mounting a water-wheel upon a raft, which is to be fastened alongside the vessel; and the power obtained, by the motion of the wheel, is to be applied, through the medium of ropes and pulleys, to raising the coals or other substances.

The patentee claims, Firstly,—the mode of working dredging machines, as above described, by means of the power of the tide. Secondly,—the mode of arranging machinery for lifting stones or other ponderous bodies, as above described. Thirdly,—the mode of applying an additional cylinder to condensing steam-engines, for supplying the condensing water, and obtaining power thereby, as above described. Fourthly,—the mode of traction on or in canals, or other waters, by atmospheric pressure, acting with a vacuum obtained by water, as above described. Fifthly,—the mode of loading and unloading ships or vessels, by means of the power of the tide.—[*Inrolled in the Inrolment Office, October,* 1844.]

To JONATHAN SAUNDERS, *of Soho-hill, Birmingham, Gent., for improvements in the manufacture of tires of railway and other wheels, and in the manufacture of railway and other axles.**—[Sealed 5th October, 1843.]

THE improvements in the manufacture of tires for railway and other wheels, which constitute this invention, consist in so piling steel with iron that the steel may be at those parts of the surface most liable to wear, when the piles of steel and iron are rolled into bars, suitable for making tires.

The pieces of steel are piled with the iron, and the pile is heated to a welding heat; it is then passed under the tilt-hammer, and formed into a bloom; and is afterwards rolled into a bar of the proper form for making tires. The piling may be accomplished in various ways; the patentee does not, therefore, confine himself to any particular arrangements of the parts of a pile, so long as iron and steel are piled together, when manufacturing tires for railway or other wheels.

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* By a disclaimer, dated April 5, 1844, the patentee has struck out these words "and in the manufacture of railway and other axles" from the title of this patent.

In Plate XIV., fig. 1, is a section of a pile of iron and steel, and fig. 2., a section of a railway-tire produced therefrom; fig. 3, is a section of another pile, and fig. 4, a section of a railway-tire produced therefrom. *a, a,* are the pieces of iron; and *b, b,* the pieces of steel. In some cases, the steel in the pile is covered with a thin surface of iron, which is removed when turning the wheel in the lathe.

The patentee claims the mode of manufacturing tires for railway and other wheels, by rolling them from piles of iron with steel, in such manner that the steel may come to the wearing surfaces, as above described.—[*Inrolled in the Inrolment Office, April,* 1844.]

To JOSEPH EUGENE CHABERT, *of Paris, but now of Chancery-lane, in the city of London, Gent., for improvements in preparing materials to be used in making picture and other frames, and for architectural and other purposes.*— [Sealed 10th October, 1844.]

THIS invention consists in the preparation of a liquid mixture, to be used for making picture and other frames, and for architectural and other purposes. The materials employed are glue (which is preferred to be made from rabbit-skins), gelatine, oxide of lead, Spanish white, saw-dust, and sulphate of lime. These are used in the proportion of twelve parts of glue, one of gelatine, four of oxide of lead, eight of Spanish white, one of saw-dust, and ten of sulphate of lime. The glue and gelatine are melted, and then mixed with the oxide of lead; after which the Spanish white and saw-dust are incorporated therewith (and if the mixture is required to be of any particular color, a small quantity of lamp-black, yellow ochre, or other suitable coloring matter is added at this part of the process); and, lastly, the sulphate of lime is introduced, and the whole well mixed together. The mixture is run into moulds, which have been previously oiled or greased, and, after remaining for about five minutes, is removed therefrom: when cold, it is finished off in any suitable manner.

The patentee states that he does not confine himself to the precise materials mentioned, nor the quantities of the different materials employed, so long as the character of the composition be retained, viz.,—that of using oxide of lead and sulphate of lime with other matters, such as are herein mentioned, made into a suitable liquid, to be run into moulds.—[*Inrolled in the Inrolment Office, April,* 1845.]

To William North, *of Stangate, in the county of Surrey, slater, for improvements in covering roofs and flats with slate.*—[Sealed 14th November, 1844.]

This invention consists in using wooden battens for fastening on the slabs of slate used in covering roofs and flats of buildings, instead of fixing them to the rafters or joists; the object being to prevent the joints of the slates becoming defective from the warping or vibration of the roof or flat.

In Plate XIV., fig. 1, is a plan view of part of an improved roof; and figs. 2, and 3, are edge views of fig. 1. *a, a,* are the joists or rafters; *b, b,* wooden battens, which rest in recesses cut in the joists or rafters; and *c, c,* laths or battens placed between the battens *b, b.* The slates *d, d,* are fastened to the battens *b,* and *c,* by means of the screws *e, e;* and the edges of the slates are cut away underneath, as shewn, to form a channel for the reception of the putty or cement in which they are imbedded.

The patentee claims the mode of combining wood battens with slate coverings for roofs and flats, as above described.—[*Inrolled in the Inrolment Office, May,* 1845.]

To David Metcalf, *of Leeds, in the county of York, dyer, for a mode of manufacturing or preparing a new vegetable preparation, applicable to dyeing blue and other colors.*—[Sealed 21st November, 1844.]

This invention consists in the manufacture of a new vegetable preparation for dyeing, by subjecting the leaves of a certain plant, sometimes called "succory," but more commonly known as "chicory," to the same process of manufacture or preparation as has been heretofore applied to the leaves of the woad plant, in order to fit them for the dyer's use.

The leaves of the chicory plant are first ground or crushed in a mill, such as is ordinarily employed in the preparation of woad; then the granulated mass is formed into balls, which, when sufficiently dry, are broken into small pieces, and subjected to the fermenting process termed "couching;" after which the article is ready for the dyer.

In some cases, the leaves of the chicory plant are sufficiently dry, after the first grinding, to be subjected at once to the couching process, without the delay occasioned by the preparatory drying.

The patentee claims the manufacture or preparation of the leaves of the chicory plant, in the manner above described, for the purpose of obtaining a new vegetable preparation, applicable to the dyeing of blue, and of all other colors to which woad is applicable.—[*Inrolled in the Rolls Chapel Office, May,* 1845.]

To WILLIAM NEWTON, *of the Office for Patents,* 66, *Chancery-lane, in the county of Middlesex, civil engineer, for an invention of certain improvements in obtaining copper from copper ores; some part or parts of which improvements are applicable to obtaining certain other metals in some copper ores,—being a communication.*—[Sealed 30th May, 1843.]

THIS invention, as communicated to the patentee by a foreigner residing abroad, consists in certain processes or operations, by means of which the copper contained in certain materials, obtained from copper ores by known processes, and hereinafter called "sulphuret materials," is converted into sulphate of copper; which sulphate of copper, when extracted, (or oxide of copper, obtained therefrom), is applied to the production of metallic copper. Also, in certain processes or operations, by means of which silver or gold, or both these metals, and also copper, are extracted from certain materials hereinafter described; and which materials are obtained from some copper ores by known processes.

The principal ores from which copper is usually obtained contain sulphuret of copper, combined with sulphuret of iron, and mixed with various earthy matters. Copper is also obtained from other ores in which this metal exists in the state of oxide. Some copper ores contain other metals than copper and iron, such as tin, zinc, gold, and silver. Gold and silver are contained in some copper ores, in such proportion as to render it desirable to obtain these metals, or one of them, separate from the copper.

The usual mode of proceeding, for obtaining copper from ores containing sulphuret of copper and sulphuret of iron, is, first, to calcine the ore employed, and thus to drive off sulphur therefrom, and produce oxide of iron. The calcined ore is melted, and the earthy matters combine with oxide of iron, and form "slag." The copper, and a portion of the iron, and also of the other metals previously contained in the ores, remain combined with sulphur, and produce metallic sulphurets: this product is usually called "coarse metal."

The next operation consists in calcining this coarse metal, and thus driving off a further portion of sulphur, and forming a further portion of oxide of iron, and also some oxides of other metals. The product is melted, when oxide of iron and oxides of other metals pass into the slag, and copper is again obtained in the state of sulphuret, still combined with sulphuret of iron, and with sulphurets of other metals which have been present in the ores employed. The proportion of sulphur and of iron in this product decreases with the extent to which the calcination of the coarse metal has been carried; and the proportion of copper therein increases in the same ratio. The sulphuret obtained is called "blue metal," "white metal," or "pimpled metal;" the latter being produced from coarse metal, which has been most calcined; the blue metal from that which has been least calcined; and the white metal being an intermediate product. It is found convenient to mix those copper ores which have been referred to, as containing copper in the state of oxide, with calcined coarse metal, and to melt these together; by which means the oxide of copper of these ores is converted into sulphuret of copper, and is obtained in the blue metal, white metal, or pimpled metal, produced.

When the ores employed contain so small a quantity of other metals than copper and iron, that the proportion of these other metals remaining in the blue metal, white metal, or pimpled metal, is not so great as to prevent the manufacturer, by subsequent processes, obtaining copper of the quality he is desirous to obtain, the next process, usually employed, is to subject the blue metal, white metal, or pimpled metal, to an operation called "roasting," and to continue this operation till nearly all the sulphur is expelled from the metal. A further production of oxide of iron, and oxides of some other metals, takes place, and these oxides are separated in the slags of this operation, and a product is obtained called "coarse copper." The copper in this product is still combined with some sulphur, and with iron and other metals, originally present in the ores employed. The coarse copper is next subjected to the process of "refining," by which the copper is sufficiently freed from sulphur, and from iron and other metals, to render it suitable for use; and it is then called "fine or tough copper." If the ores employed contain gold or silver, the metal so contained, or the greater part of it, will be present in the coarse metal, blue metal, white metal, pimpled metal, and coarse copper, produced therefrom.

When the ores employed contain such a proportion of other metals than copper and iron, that these other metals cannot be sufficiently separated by the operations hereinbefore referred to, so as to render the copper produced suitable for its intended purpose; or when it is desired to obtain copper more than usually free from other metals, the blue metal, white metal, or pimpled metal, is usually subjected to a short process of roasting or calcining, followed by a "melting," and two distinct products are obtained, in addition to the slag. The uppermost product contains copper and iron, in the state of sulphuret, and is usually called "regulus." It also contains a small proportion of other metals than copper and iron, originally present in the ores employed. The lowermost product is coarse copper, which contains copper, and some sulphur, and iron; it also contains a larger proportionate quantity of other metals than copper and iron (originally present in the ores employed) than is contained in the regulus; and if the ores employed contained gold or silver, the coarse copper thus produced will contain a larger proportionate quantity of this gold or silver than will be present in the regulus thus produced. For the purpose of distinction, in his specification, the inventor has called this coarse copper (obtained by the operation by which regulus is also produced) "residual coarse copper."

The regulus, above described, is subjected to the process of roasting, to produce coarse copper, which is afterwards refined; and fine copper, of superior quality for some purposes, is thereby obtained. The residual coarse copper obtained, as above described, is also usually subjected to the process of refining, by which sulphur and iron, and a portion of other metals, originally contained in the ores, are separated, and copper is obtained sufficiently pure for many purposes; but its commercial value is less than that of copper obtained from regulus.

When this residual coarse copper contains gold or silver in such proportion as to render it desirable to obtain the gold or silver separate from the copper, the residual coarse copper is melted with such a quantity of sulphureous copper ore or of iron pyrites as will convert the metals present in the residual coarse copper into sulphurets; a product is thus obtained containing these sulphurets, and also a considerable portion of sulphuret of iron, proceeding from the copper ore or iron pyrites used. This product resembles the products called blue metal and white metal, hereinbefore referred to, and is suitable to be subjected to the processes, hereinafter described, to be used in treating such metals.

The products above mentioned, viz., coarse metal, blue metal, white metal, pimpled metal, regulus, residual coarse copper (when it contains gold or silver, or both these metals), and also the products obtained by melting the residual coarse copper—all containing copper combined with sulphur, forming sulphuret of copper; also iron combined with sulphur, forming sulphuret of iron,—are the certain materials before referred to, as the materials from which silver or gold, or these metals, and also copper, are to be extracted.

In effecting these improvements, any of the said products may be used;—the product preferred should be of a quality (as respects the proportions of sulphur, iron, and copper, contained therein) similar to that of blue metal, or white metal, and, for the sake of distinctness, the product which is employed will be designated as "sulphuret material." This material is reduced to powder, and introduced into an oven or furnace, wherein it is heated, and exposed to atmospheric air, when the sulphuret material takes fire, and undergoes combustion; by which means, sulphur and copper, contained in the material, combine with oxygen, and produce sulphate of copper and oxide of copper; and sulphur and iron, contained in the material, also combine with oxygen, producing sulphate of iron and oxide of iron; and when sulphuret of silver is contained in the sulphuret material used, it also combines with oxygen, producing sulphate of silver and oxide of silver. This combustion is facilitated by raking the sulphuret material, and by having a supply of air passing through the oven or furnace: the operation may be considered complete when the combustion ceases to be perceptible. In effecting this operation, only just sufficient heat should be applied to the sulphuret material to commence and keep up the combustion, which should be proceeded with so slowly as not to be completed in less than ten hours (the sulphuret material being frequently raked); as by these means a product is obtained, of which a larger proportion of copper is soluble in water than is the case when a higher degree of heat has been applied; and if sulphuret of silver be contained in the sulphuret material employed, a portion of this metal is obtained soluble in water: this operation the inventor calls the "sulphating operation," and the product obtained, "sulphated material." The sulphated material is subjected to the well-known processes of lixiviation, using sulphuric acid, mixed with water, as a dissolving menstruum; and thus copper and iron, and also silver (if this metal were present in the sulphuret material employed), are dissolved: the sulphated material does not become entirely dissolved by the acid and water used. The undissolved residuum usually contains copper, chiefly in the state of sulphuret; also iron, partly as sulphuret, but chiefly as peroxide of iron, and silver or gold, provided either of these two metals were present in the sulphuret material employed: this residuum is termed "sulphate residuum." If the solution, obtained by lixiviation, contains silver, this metal is precipitated by introducing plates of copper therein, or by other well-known means; and when precipitated, it is refined, and made suitable for use. The solution contains sulphates of copper and iron, which are concentrated by evaporation in leaden pans, and transferred to a reverberatory furnace, wherein the remaining portion of water is expelled, and dry sulphates of copper and iron are obtained.

Sulphuret material, containing silver or gold, or both these metals, is subjected to the processes, hereinbefore described, for sulphuret material, to obtain part of the silver in solution, and another part in the sulphate residuum; and when gold is present in the sulphuret material, it remains in the sulphate residuum. When sulphate residuum, containing copper and silver, in the proportion of one hundred parts, or more, of copper to one part of silver, is obtained, such residuum is added to a further quantity of calcined copper ore, containing silver, and melted with it, to produce coarse metal, which will contain sulphuret of silver, produced from the sulphate residuum, also from the copper ore. The coarse metal, thus obtained, may be subjected to the sulphating operations hereinbefore described, and to lixiviation; but it is preferred to convert the coarse metal into blue metal, or white metal, by calcining and melting it; the product, thus obtained, is subjected to the sulphating operation, and to lixiviation. By these means, a further portion of copper, and a further portion of silver, in solution, is obtained from the sulphate residuum, and also a new sulphate residuum, which usually contains less than one hundred parts of copper, to each part of silver present therein.

When sulphate residuum, containing copper and silver, in the proportions of less than one hundred parts of copper to one part of silver, is obtained, it is preferred to be melted with such a quantity of sulphurous copper ore, or iron pyrites, as will convert the copper and silver of the residuum into sulphurets; by this means, a sulphuret material, comparatively rich in silver, is obtained; and when subjected to the sulphating operation, and to lixiviation, a further portion of copper and of silver is obtained in solution, and also a sulphate residuum, which usually contains copper and silver, in the proportions of less than fifty parts of copper to one part of silver: this product is called "rich sulphate residuum." It is preferred to calcine this rich sulphate residuum, so as to convert sulphuret of copper, contained therein, into oxide of copper, and to digest this calcined residuum with a mixture of sulphuric acid, nitric acid, and water (assisting the action by heat), and thus to dissolve copper and silver; the silver is then precipitated from the solution, by the means before described, and sulphate of copper is afterwards obtained from the solution. The mixture of acids used does not usually effect a complete solution of the rich sulphate residuum, therefore the undissolved portion (if any remain) is added to a further portion of sulphate residuum, containing less than one hundred parts of copper for each part of silver present therein. These sulphates are melted with sulphurous copper ore, or iron pyrites, so as to obtain a rich sulphuret material, which is subjected to the operations above described, so as to extract copper and silver therefrom.

Instead of treating the sulphate residuums containing silver, as hereinbefore described, the inventor sometimes melts these (preferring to select, for this purpose, rich sulphate residuums, and to calcine these previously to melting,) with litharge, or with metallic lead. When litharge is used, twelve parts of litharge and one part of small coal are mixed with four parts of residuum, and by melting this mixture, an alloy, containing lead, silver, and some copper, is obtained. The silver may be extracted from this alloy by the process of "cupellation." When sulphate residuum is melted with metallic lead, the lead should be previously granulated, and mixed with the residuum (previously calcined), in the proportion of twenty parts of lead to eight parts of residuum, to which is added one part of small coal; these matters being melted, an alloy is obtained, containing lead, silver, and copper: the silver can be obtained from this alloy by cupellation.

If the sulphuret material, originally employed, contained gold as well as silver, gold will be present in the undissolved portion, remaining after digesting rich sulphate residuum with sulphuric and nitric acids; in this case it is preferred to mix this undissolved portion with four times its weight of litharge, and half its own weight of small coal, and to melt these together; an alloy, containing lead and gold, and usually silver, is thus obtained: the gold and silver, or one of these metals, is separated from the lead by cupellation; and if both gold and silver are obtained, they are separated by the means usually employed for that purpose.

It has been stated, that if the sulphuret material employed contained gold, this metal remains in the sulphate residuum. When the proportion of gold in the residuum does not exceed four ounces in each ton, it is preferred to melt such residuum with calcined copper ore, also containing gold, so as to produce coarse metal, which is then treated in the manner before described, for treating coarse metal obtained from residuum containing silver, after this has been melted with calcined copper ore. By this means a further portion of copper, in solution, is obtained, which is reduced to dry sulphate of copper; also a sulphate residuum, which usually contains more than four ounces of gold in each ton of residuum. This residuum is melted with such a quantity of sulphurous copper ore, or of iron pyrites, as will convert the metal contained therein into sulphuret; and thus a sulphuret material is obtained, which may be subjected to the processes, hereinbefore described, for treating sulphuret material; and sulphate residuum is also obtained, containing a still larger proportion of gold: this residuum is calcined, to convert sulphuret of copper, contained therein, into oxide of copper, and the calcined product is digested with a mixture of sulphuric and nitric acids and water, and, with the assistance of heat, copper is dissolved. A portion of the residuum remains undissolved, containing gold; this undissolved portion is mixed with eight times its weight of litharge, and its own weight of small coal, and, by melting the mixture, an alloy, containing lead and gold, is obtained; and from this alloy the gold is extracted by cupellation.

Gold may also be obtained from the undissolved portion, remaining after digesting sulphate residuum, containing gold, with sulphuric and nitric acids, by digesting this undissolved portion with nitro-muriatic acid, and with the assistance of heat; thus dissolving gold, which may be precipitated from the solution by well known means; and the precipitated gold, being collected, should be refined in the usual manner. It will usually happen, that an undissolved portion will remain after the treatment with nitro-muriatic acid; and as this may contain gold or silver, it is to be melted with sulphurous copper ore, or iron pyrites, and the sulphuret material, thereby obtained, is to be subjected to the processes, hereinbefore described, for treating sulphuret material.

If the sulphate residuum, which is melted with litharge or lead, contains much copper, the alloy produced will contain such a proportion of this metal as to render it desirable that it should be obtained separate; for this purpose the alloy is subjected to the known processes of "eliquation," and "darring," or cleansing.* Lead is thus obtained, containing gold or silver, and nearly free from copper; and this lead is subjected to cupellation, to obtain gold or silver therefrom; and the copper, obtained by these means, is converted, by the process of refining, into fine copper.

Silver or gold, or both these metals, may also be obtained from the product termed residual coarse copper, by melting the residual coarse copper (without previously calcining it) with lead or litharge, and subjecting the alloy, thereby obtained, to the processes, hereinbefore described, for treating the alloy obtained from sulphate residuum; but the inventor prefers to convert the residual coarse copper into sulphuret material, and to subject this to the processes, before described, for extracting copper, and silver or gold, therefrom; as, by these means, a great waste of lead is prevented, which occurs when silver or gold is obtained from residual coarse copper, by melting this with lead or litharge, and subjecting the alloy obtained to the processes of eliquation, and darring, or cleansing, hereinbefore referred to.

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* These processes are extensively used in Germany, for separating copper and silver, and are fully described in a book, called "The Records of Mining," edited by John Taylor, and published by John Murray, 1829.

The sulphate of copper, produced from sulphuret materials, by the operations above described, is used for obtaining metallic copper: this may be effected by various known processes; but it is preferred to mix the sulphate of copper with coarse metal, blue metal, white metal, pimpled metal, or regulus; and, by melting the mixture, coarse copper is obtained therefrom, suitable to be refined into fine copper. When sulphate of copper is mixed with coarse metal, such a proportion of sulphate is used as will contain about twice as much copper as may be present in the coarse metal; and when sulphate of copper is mixed with blue metal, white metal, pimpled metal, or regulus, the proportion of sulphate employed should contain about as much copper as may be present in the material mixed with it.

It has been hereinbefore stated, that sulphuric acid, mixed with water, is to be used for lixiviating the sulphate material herein referred to; and this acid the inventor sometimes obtains by decomposing sulphates of copper and iron, obtained as herein mentioned. For this purpose, these sulphates are exposed (in retorts or ovens, made of fire-clay or brick-work) to a strong red heat, and the sulphuric acid, distilled therefrom, is condensed in suitable vessels. The residuum, which remains in the retorts or ovens, contains oxides of copper and iron, and usually subsulphates of copper and iron, and is to be employed in place of sulphate of copper, to melt with sulphuret material, for the purpose of obtaining coarse copper; about two parts of this residuum being substituted for one part of sulphate of copper.

The operation of melting the various compounds and mixtures, hereinbefore mentioned, is preferred to be effected in a melting-furnace, such as is generally used for melting copper ores; and such fluxing materials are added to the compounds or mixtures, undergoing this operation, as have been found, by experience, to be suitable to assist the melting of similar compounds or mixtures. The slags, produced by melting compounds or mixtures containing a large proportion of metal and a small proportion of sulphur, are transferred to those meltings in which the compounds or mixtures contain a smaller proportion of metal and a large proportion of sulphur; and thus metal is extracted from such slags, and the melting of the compounds or mixtures is facilitated.

The patentee claims the use of such materials as are herein called coarse metal, blue metal, white metal, pimpled metal, and regulus (procured from copper ores by known processes), for obtaining copper therefrom, by converting sulphuret of copper, therein contained, into sulphate of copper and oxide of copper, and extracting such sulphate and oxide of copper, by dissolving these with sulphuric acid and water, and obtaining metallic copper from sulphate of copper, so extracted. He also claims the use of sulphate of copper (procured as herein described) and oxide of copper (obtained from such sulphate) for the purpose of melting these, or either of them, with such materials as are herein called coarse metal, blue metal, white metal, pimpled metal, and regulus (procured as above described), and thereby facilitating the extraction of copper from such materials. Lastly, he claims the use of such materials as are herein called coarse metal, blue metal, white metal, pimpled metal, and residual coarse copper (procured by known processes from copper ores containing silver or gold, or both these metals), for the purpose of obtaining silver or gold, or both these metals, and also copper, therefrom, by converting sulphuret of copper, contained in these materials, into sulphate of copper and oxide of copper, and subsequently into metallic copper; and by converting sulphuret of silver, contained in these materials, into sulphate of silver and oxide of silver, and subsequently into metallic silver; and by extracting silver or gold, or both these metals, and likewise copper, from the residuums herein called sulphate residuums, by the use of acids; or by extracting silver or gold, or both these metals, and also copper, from the said residuums, or from residual coarse copper, by the use of lead or litharge, as herein described.—[*Inrolled in the Petty Bag Office, November,* 1843.]

Specification drawn by Messrs. Newton and Son.

To Samuel Atkinson, *of Manchester-street, Gray's-Inn-road, in the county of Middlesex, turner, for improvements in the construction of wheels for carriages.*—[Sealed 4th March, 1844.]

This invention consists in constructing wheels for carriages with iron or other metal spokes, combined with naves and felloes of wood.

In Plate XV., fig. 1, is a vertical section of a wheel, constructed after this method; and fig. 2, a side view thereof. *a, a,* are the wooden felloes; *b,* is the tire; *c,* the wooden nave; and *d, d,* iron spokes, which enter mortices in the nave and felloes. The spokes *d,* are similar in shape to those of the ordinary wooden construction; but they may be varied, if thought desirable; the ends also which enter the mortices in the nave and felloes may be varied, as will be seen at figs. 3, where two differently shaped spokes are shewn, with the same mode of fixing them; the ends which enter the nave being jagged. If preferred, the spokes may have screws formed on the end which enters the nave, as at *e, e, e,* figs. 4; and their other ends may be secured to the felloes by screws and nuts, as at *f, f,* figs. 4.

In some cases, the spokes are made of iron tubes, filled with wood. Fig. 5, is a vertical section of a wheel constructed with these spokes; and fig. 6, is a side view of the same. These spokes are fixed in the nave and felloes by using wedges to open out the ends; thus, when driving the end of a spoke into the nave, the sharp edge of the wedge is introduced into it, and, as the spoke is driven in, the wedge expands the end; and when the other end of the spoke has been driven into a felloe, it is in like manner expanded by means of a wedge: to facilitate the expansion of the ends of the spokes, the tube is split in the manner shewn at fig. 7.

The patentee claims the means of manufacturing wheels for carriages, whereby iron or other metal spokes are combined with wood felloes and wood naves, as above described.—[*Inrolled in the Inrolment Office, September,* 1844.]

To Wilton George Turner, *of Gateshead, in the county of Durham, Doctor in Philosophy, for an improved mode of directing the passage of, and otherwise dealing with, the noxious vapours and other matters arising from chemical works in certain cases.*—[Sealed 22nd August, 1844.]

This invention consists, chiefly, in the application of a draft, produced by mechanical means, to the manufacture of sulphuric acid, muriatic acid, and sulphate of soda, and to various metallurgical operations (such as roasting and smelting ores), in aid of, or as a substitute for, the ordinary draft produced by a chimney; by which means, together with certain improved processes, the condensation is effected of that portion of the acid gases and metallic fumes which are allowed to escape into the open air, in the usual modes of manufacture.

The apparatus for condensing the fumes arising from various metallurgical operations consists of a vessel, similar in form to the ordinary waggon-shaped boiler, connected, at one end, with the furnace from whence the fumes proceed, and furnished with a vertical funnel, or chimney, at the other end; a horizontal shaft passes through the vessel, lengthwise, having a large screw upon it, which extends from the furnace-end of the vessel to the chimney-end; and, in the spaces between the turns of the screw, long arms are fixed upon the shaft, corresponding in length with the radius of the thread of the screw. Water is allowed to flow into the vessel, until the edge of the screw is immersed from three to four inches; then a rapid rotation is given to the screw-shaft, and the fumes, entering from the furnace, are violently beaten about with the water, until thoroughly wetted, when, becoming too heavy to pass on with the draft, they fall to the bottom of the vessel: the water is drawn off from time time into receivers, in which the metal becomes deposited. When no corrosive gases accompany the fumes, the vessel is made of iron; but if corrosive gases are evolved, the vessel is built of brick or stone, cemented with fire-clay, and the screw is made of or covered with lead.

The means by which the patentee produces a draft, and a perfect condensation of the acid gases, in the manufacture of sulphuric acid, are as follow:—The new part of the apparatus consists of a series of three air-tight wooden vessels or condensers, lined with lead; into the lower part of the first condenser, the draft-pipe, from the ordinary sulphuric acid chamber, is introduced, and its end is covered with acid to the depth of two or three feet; from the top of this condenser, a pipe is conducted, in like manner, into the lower part of the second, and its end is covered with acid; and from the top of the second, a pipe is likewise carried to the third. The last condenser (which is only half the size of either the first or second) is connected with two air-pumps, of sufficient capacity to draw through 162,000 feet of air for every hundred pounds of sulphur burnt, and cause a partial vacuum in the upper parts of the condensers; in consequence of which, the gases from the acid-chamber will force their way, in a continuous stream, through the acid in the condensers; being diffused therein by two inclined leaden plates, fixed in the lower part of the first and second condensers.

The patentee states, that, in the present mode of manufacturing sulphuric acid, there are three causes which produce the loss of nitre; viz., first, the complete decomposition of nitric acid which accompanies the formation of the crystalline compound of sulphuric and hypo-nitrous acids; secondly, the absorption of a portion of nitric acid by the sulphuric acid of the chamber; and thirdly, the escape of nitrous acid from the chamber, through the draft-pipe. This loss he prevents, or greatly diminishes, first, by avoiding the formation of the crystalline compound of sulphuric and hypo-nitrous acids, by not throwing in steam; using nitric acid in the acid-chamber, instead of nitre in the furnace; thus limiting the action which produces the sulphuric acid to the absorption of the sulphurous acid by the chamber acid, so as to render the great height of the ordinary acid-chamber unnecessary; the top of the chamber, in this case, being not more than two feet above the chamber acid, which is about one foot deep; and, secondly, by the application of the condensers and air-pumps.

In manufacturing the sulphuric acid, the following is the mode of operating:—The acid-chamber is charged with acid of from 1·5 to 1·6 sp. gr., and an addition is made thereto of three or four per cent. of nitric acid; the first and second condensers are charged with the same, which is kept at a heat of 140° Fahr., by steam-pipes passing through them; and the third condenser is charged with sulphuric acid of 1.7 sp. gr. The air-pumps are now worked; and the sulphur is burnt in the furnace, without the addition of nitre. The fumes, entering the acid-chamber, are absorbed by the chamber acid, and converted into sulphuric acid; but some portion of the sulphurous acid, escaping condensation, passes through the draft-pipe into the first condenser, where, coming in contact with the nitric acid, it is converted into sulphuric acid; this is accompanied with the evolution of deutoxide of nitrogen, which, mixing with the air in the condenser, passes in the form of nitrous acid vapour into the second condenser, and is there condensed: in this way, the acid in the first condenser soon loses all its nitric acid, which must be replaced, by allowing a small quantity (say two or three per cent.) to flow in, at intervals, through a stop-cock at the top. When the sulphuric acid in the first condenser approaches 1·7 sp. gr., the action becomes imperfect, and a portion of the sulphurous acid passes into the second condenser, where it is converted into sulphuric acid, and the nitrous fumes, produced, pass into the third condenser; at the same time, the supply of nitric acid to the first condenser must be stopped, in order to obtain the sulphuric acid perfectly free from nitric acid. As soon as all the nitric acid has passed from the first condenser, the acid in the third, which has now become nitrous, is allowed to flow into the acid-chamber, and a new charge is drawn from the first condenser; the remaining acid in the latter is now drawn off for use, and it is recharged from the acid-chamber. To keep the acid in the second condenser in working condition, its strength (which has the same tendency to increase as that of the acid in the first condenser) is kept down by the addition of water.

To condense muriatic acid, in the manufacture of sulphate of soda, a similar set of air-tight vessels and air-pumps may be connected with the furnace in which the salt is decomposed, and the condensation effected by means of water;

but, as the volatility of the solution of muriatic acid, particularly under the diminished atmospheric pressure caused by the air-pumps, renders their use somewhat objectionable, the patentee prefers to employ the screw draft apparatus; passing the gases through two vessels, furnished with screw-shafts. In this case, the vessel should be built of close-grained sand-stone, cemented with fire clay, and the screw made of or lined with fire-brick material; the screw may be about three feet in diameter, and fixed upon a wooden shaft.

The patentee claims, Firstly, the application of a screw and arms, working in the water; the one for the purpose of creating and increasing the draft from, and the other for wetting, and thus condensing, by increasing the specific gravity of, noxious vapours, proceeding from furnaces in which the roasting and smelting of metallic ores, and other metallurgic processes, are being carried on. Secondly, the application of the said screw, or of air-pumps and condensers, in the manufacture of sulphuric acid, muriatic acid, and sulphate of soda. Thirdly, the addition (in the manufacture of sulphuric acid) of nitric acid to the sulphuric acid in the acid-chamber, in place of using nitre in the furnace. Fourthly, the substitution of a shallow sulphuric acid chamber for the deeper one heretofore used for such manufacture, and not introducing steam into it; thereby preventing the formation of the crystalline compound of sulphuric and hypo-nitrous acids therein. Fifthly, the working the vapours in and escaping from the acid-chamber through the condensers, with the condensing media, and in manner hereinbefore described.—[*Inrolled in the Inrolment Office, February,* 1845.]

REPORTS OF AMERICAN PATENTS.

From the "Journal of the Franklin Institute,"

EDITED BY DR. THOMAS P. JONES.

To JACOB D. FULKERSON, *Unity, Columbiana county, Ohio, for an improvement in bee-hives or palaces.*

THE palace is a square box, divided into four compartments by two vertical partitions, at right angles; the one that is parallel with the two doors, on the front and back, extends from the bottom to the top, where there are apertures for ventilation; each of these apartments is divided into three stories by shelves, that incline from the doors towards the main partition, the back edge of the shelf not coming quite up to the partition, but leaving sufficient space for the entrance of the bees, there being vertical partitions that extend from the bottom of one shelf to within a short distance of the top of the next. The main partition only extends down from the top to the third shelf, and from the lower end of it two boards extend out, one on each side, at an inclination the reverse of the shelves, and about half of the lowest compartment has the same inclination, thus leaving a passage for the bees. The under edge of the last-named inclined board, and the bottom of the lowest compartment have pieces of glass attached to them, and of less inclination, that form receptacles to catch the moth, and prevent their entrance to the hives; below these pieces of glass are placed the lighting-boards, and shield-boards.

Claim:—"What I claim, is the combination and arrangement for defending the hopper-formed entrances, by means of the glass placed around the entrance thereof, and the shield-boards constructed and arranged as above specified; the form of the hive being as set forth."

To PETER BAYLOR, *near Salem, Columbiana county, Ohio, for an improvement in the method of securing boring machines to pieces of timber that are to be bored.*

THE machine is secured to the timber by means of a hook, jointed to the end of a lever, connected with the machine by a bolt, that passes through a slot in the lever, and another in an axle, in such manner that the position of the lever and hook may be varied, to suit timbers of various sizes, &c.

Claim:—"What I claim, is the combination of the oblong, perforated, vibrating axle, the oblong perforated lever connected thereto by a screw-bolt, and the hook for grasping or gripping the article to be bored, with the machine for boring, in the manner and for the purposes set forth."

To FREDERICK A. STEWART, *Catharine, Chemung county, New York, for an improvement in blacksmiths' forges.*

THE hearth of the forge is made to slide up and down in a sink, or well, provided with an aperture at the bottom, for the removal of the cinders, &c., when the sink has been filled up.

Claim:—"What I claim, as my invention, is causing the fire, cinders, and dirt, to descend into a well in the bed of the forge, when fresh coal is to be supplied, without disturbing the fire, and accumulating the cinder and dirt on the hearth, as in the common forge; the cinders and dirt being removed from said well through an aperture, or opening, at the bottom thereof; and this principle I claim, whether it be effected in the manner set forth, or in any other mode in which analogous means are used."

To Isaac Crossett, *East Bennington, Bennington county, Vermont, for improvements in machinery for making barrels and casks.*

The staves and heading are cut from steamed timber, by means of knives; the cutter for the staves is of a curve, equal to the circumference of the barrel; and the ben, on which the block rests, vibrates on centres instead of the cutter, for the purpose fully expressed in the claim. In the machine for cutting headings, the knife, or cutter, is attached to one lever, and the bed, on which the block rests, to another, by which means any amount of draw can be given to the cut. And in the machine for trimming, or forming, the heads, the mandril (which holds the head) is supported in a frame, separate from the frame in which the mandril of the cutters work; so that the one can be presented to the other, the frame of the former sliding on that of the latter. There are two sets of cutters, or segments of saws, attached to a face-plate, one being attached to, and parallel with, the face, and the other attached to the periphery, and forming segments of a hollow cylinder; so that, by presenting the head to these cutters, or saws, at an inclination, and giving it a slow rotary movement, both bevils are formed at one operation, instead of two, as heretofore.

Claim:—"What I claim, is, first, in the heading-cutter, attaching the knife and bed each to a lever, so arranged as to cause the knife and bed to move in opposite directions; by means of which arrangement more or less draw can be given to the cutter, as described; second, in the stave-cutter, the vibratory motion given to the head-piece, by which means the labour of feeding the machine is greatly facilitated, inasmuch as the bed is inclined downwards towards the gauge when it is ready to cut, (which makes it feed easily), and from the knife after the cut; so that the block can be more easily withdrawn to turn it in the machine, or to take off the core; third, in the head-machine, the fixing of saws or cutters, in the face and on the periphery of a revolving wheel, to cut complete heads, at one operation, from pieces presented to it under an angle, as set forth.

To William W. Hubbell, *Philadelphia, Pennsylvania, for an improvement in fire-arms.*

The patentee says:—"The nature of my invention consists in detaching so much of the breech-end of the barrel as will contain the charge from the main part of the barrel, by having it to flap over to one side of the barrel, on a rod which runs parallel with the barrel, and thus expose itself to receive the charge; after receiving which, it is flapped back to discharge the load through the main part of the barrel.

Claim:—"What I claim, as my invention, is the breech opening and closing on a rod, as a centre, which runs parallel with the main barrel in the operation of firing fire-arms."

To JOHN MADDEN WARREN, *Trumbull county, Ohio, for an improvement in the mode of detaching horses from carriages.*

AT the back of the whipple-tree there are two "revolving shafts," extending from near the middle to the ends; the ends of these shafts are bent at right angles, and they are so arranged that the outer end of each one, which is flattened for that purpose, covers the end of the pin on the whipple-tree, to prevent the traces from flying off; and to the inner ends a cord is attached, to enable the driver to turn the shafts, and thus uncover the ends of the pins, and permit the traces to escape.

Claim:—"What I claim, as my invention, is the combination of the revolving shaft, arms, and cam, with the whipple-tree, in the manner and for the purpose described, the whole being constructed and arranged as before specified."

To OLIVER B. WIGHT, *Sturbridge, Worcester county, Massachusetts, for an improvement in washing machines.*

THE box containing the clothes slides back and forth on a frame, and is provided with rollers along the bottom, on which rests a cloth fastened to the box at each end: there is a "rocking beater" (the shaft of which has its bearings working in slots in two standards of the main frame) with the bottom cylindrical, with slots projecting from the periphery, at such distances apart as to correspond with the spaces between the rollers at the bottom of the box. The clothes to be washed are placed on the cloth, and by rocking the beater they are squeezed in between the rollers as the box vibrates.

Claim:—"What I claim, as my invention, is the combination of the rocking-beater with the flexible bottom ("cloth") rollers and vibrating box, arranged and operated in the manner and for the purpose set forth."

To JACOB GROAT, *Troy, Renssalaer county, New York, for an improvement in the cylinder mill for grinding grain.*

THIS improvement consists in the manner of setting the grinding surfaces of a cylinder mill, by rotating the concave surface about an imaginary centre not coincident with the centre of the grinding cylinder, instead of effecting this by moving the concave directly towards or from the cylinder, by means of which a concave can be employed extending around full, or more than, half the circumference of the cylinder.

Claim:—"What I claim as new, is the method of adjusting the case, or concave, by rotating it around the cylinder, as described, by means of the grooves, ways, and adjusting screws, in the manner and for the purpose set forth, or by any other means substantially the same."

To JACOB GROAT, *of Troy, Rensalaer county, New York, for improvements in the machine for hulling and pearling rice, &c.*

THE machine which we have here, like many of the same class, consists of a reservoir and concave, or surrounding case, somewhat conical, and their rubbing surfaces are composed as fully expressed in the following—

Claim:—"What I claim as my invention is, first, constructing the revolving cone in the manner described, with alternate staves of brushes, and gum elastic, and iron, or gum elastic and iron alone, combined and operating in the manner and for the purpose set forth; secondly, I claim, in combination with the above revolving cone, a case formed of triangular-shaped files, as above fully made known; thirdly, I claim the method of combining the files with the upper and lower rings, so as to be adjustable, in the manner described, by inserting them in a groove with soft pieces of metal between them, by means of which they may be driven closer together, or separated, as occasion requires."

To JOHN COCHRANE, *Newark, New Jersey, for an improvement in the mode of regulating the supply of water in steam boilers.*

THE patentee says:—"The nature of my invention is such that it is necessary for the pump attached to the engine to be of sufficient size to meet the expenditure of water in the boiler from evaporation, and other causes, and that it be allowed to work its capacity; the apparatus being capable, without manual assistance, of applying so much of this water as may be required to the replenishment of the boiler, and of returning the remainder back again to the pnmp without loss of power or heat."

The apparatus consists of a vessel communicating with the boiler, by means of two pipes, one above and the other below the water line, and with the supply pump, by means of a third pipe; the passage to the third pipe is provided with a check valve, the upper end of the stem of which has a float that keeps it open as long as the water is at a sufficient elevation, but which permits it to close when the water sinks to the low water mark.

When the water is sufficiently high, and the valve, therefore, open, all the water that is forced in by the pump follows the piston back, and runs out; but when there is a deficiency of water, and the valve is permitted to rest upon its seat by the float, the water forced in does not run back until the required supply has been obtained. On the same stem with the check valve, and above it, there is another valve which commands the passage leading from this vessel to the boiler below the water line; so that when the water is sufficiently high in the boiler, the float keeps this valve up against its seat, and thus prevents the surplus water from being forced into the boiler. To insure the buoyancy of the float, in case of a leak, the inside of it communicates with the pump through the valve stem, which is hollow for that purpose, and provided with a valve opening outwards, so that the downward stroke of the pump will exhaust it.

Claim:—"What I claim is, first, the manner in which I have connected and combined the float and the check valve with the force pump, and with the boiler, as herein described, so as to allow any excess of water from the pump to return back thereto by the opening of the check valve under the action of the float; secondly, the connecting of the second valve, placed in the pipe, or opening, through which the water passes from the chamber to the boiler, with the check valve and float, so that both may be operated on by the float, for the purpose and in the manner described; thirdly, the connecting of the float internally with the pump that supplies the boiler, by means of a hollow stem and valve, in combination with the check valve, so that the float may be exhausted at each stroke of the pump, and thereby be made to discharge any water that may have leaked into it."

To JOSEPH H. BARKDULL, *Ballston, Saratoga county, New York, for an improvement in the crimp for crimping leather for horse-collars.*

THIS crimp is composed of three parts, designed in the claim by the letters *a*, *b*, and *c*, hinged together; and each part is divided in two along the middle, and connected by hinges in such manner that this middle joint of all the parts is in the same line; the hinges that connect the parts *a* and *c*, with *b*, are situated at the junction of the two halves of the parts, and the axes of these hinges are at right angles with the axes of the hinges that unite the halves of the three parts, or sections, before the stretching operation is commenced, but after that the angle varies. The connected ends of the parts, or sections, *a*, *b*, *c*, are bevilled from the hinges outwards, and the middle section *b*, is provided with curved tongues that fit and slide in mortises in sections *a* and *c*. The leather to be stretched, or crimped, is laid on that face of the instrument opposite the hinges, (which is a little rounding,) and is fastened to the outer edges by pins projecting therefrom; and then the parts, or sections, are turned on the connecting hinges, which enlarges and gives a curve in all directions to that face on which the leather is placed, which thus receives the required swell and curve; the whole is held together at the end of the operation by catches attached to the section, or part, *b*, and that take in notches in the other sections.

Claim:—"What I claim, is the combination and arrangement of the parts *a*, *b*, and *c*, constructed and arranged substantially in the manner set forth."

To William E. Arnold, *Rochester, Monroe county, New York, for improvements in the washing machine.*

The improvements claimed under this patent, are applied to that kind of washing machines in which the clothes are washed by means of a swinging beater, or dash-board, perforated for the passage of water. The first improvement consists simply in giving an inclination to this dash-board, or beater, and hinging it by the lower edge, and so connecting it at top with the swing frame that the inclination can be varied at pleasure. The object is to throw up the clothes, which are then forced back, and turned by a reciprocating wedge, that has a movement up and down by being connected with arms that project out from the top of the swinging frame, so that as the dash-board advances towards the wedge, it rises, and descends as the dash-board is moved back.

Claim:—"What I claim therein as new, is, first, the varying of the inclination of the dash-board, in the manner and for the purpose described; I likewise claim the application and use of the reciprocating wedge, constructed and operating as set forth."

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 268, Vol. XXVI.)

Sir M. I. Brunel exhibited a model of the scaffolding used by Sir Christopher Wren in the erection of the monument on Fish Street Hill. It was formerly the property of Sir William Chambers, and had been given by Mr. Heathcote Russell, C. E., to Sir M. I. Brunel, who presented it to the Institution.

Mr. Allen presented a sketch of the circular travelling crane, now in use for erecting the central or ventilating tower at the new Houses of Parliament. It consisted of a circular base curb, at the top of which was fixed a toothed rack. In the centre was fixed a vertical post, with diagonal braces, carrying a centre point, around which, the travelling crane worked, with its hoisting crab on the top. At the foot of each leg was inserted a toothed wheel, working into the rack, so that by means of winch handles the whole could be made to revolve. It was stated, that the saving in labour was very considerable, but that the saving, as compared with the cost of constructing scaffolding, would be very much greater.

"Description of the system of Scaffolding, employed at Paris, for the repairs of Public Buildings, Obelisks, &c., and of a Machine for raising Bricks, and other Building Materials." By Pierre Journet.

THE author considers, that scaffolding may be divided into two classes; the first, to comprise the more substantial kinds, which are employed in the erection of buildings and monuments; the second, including the temporary constructions, used for repairing, or decorating the exterior, or interior of public buildings, dwellings, or monuments.

He contends, that the usual method of constructing scaffolding with poles, lashed together with ropes, is vicious and expensive, and is attended with danger to the workmen. That such a system is not necessary, but that scaffolding should be so constructed, that the same materials should always serve, without cutting and without the use of ropes; and that it should be composed of a number of similar pieces, which should adapt themselves to every kind of building.

Upon these principles the author designed the scaffolding treated of in the paper, in which he describes its more immediate application to building or repairing high chimneys for steam boilers, or other similar constructions.

The distinguishing feature of the system is, that it acts by pressure upon the building, and is supported by it, as it rises, no uprights being fixed in the ground.

In the case of the construction of a chimney at each side, if it be square, or at given distances around it, if it be circular, are placed upright pieces of deal, cut to equal lengths of 5 feet; upon each of these is fixed a cleat, with an entail at the top; four binding chains, with screws at each corner, are braced tight around the chimney at the bottom of the entails in the cleats; into these entails, and hooked upon the irons at the end of the chains, are placed the brackets which support the scaffolding planks, and at the same time, the light railing for the safety of the workmen; all these pieces are made precisely similar. The workmen fix a fresh set at every height of 5 feet, taking the set from below and fixing it above, so that there are never more than two sets in use at the same time, except those which are allowed to remain for forming stages for the ladders. They are placed with great rapidity, and in descending, the men detach the uprights and binding chains, which have been allowed to remain in order to consolidate the work, while the mortar dried. The joints can be pointed as the scaffold is removed, and the work can be carefully inspected by the engineer or architect, which, in the ordinary modes of construction, is not possible.

The author contends, that this method is superior to the now usual mode of constructing chimneys, by the workmen standing withinside, upon a scaffold formed upon bars let into holes in the work, and which obliges the men to lean over to do their work.

In repairing chimneys, obelisks, columns, &c., he has used it very extensively, and the saving of expense is very considerable.

It is stated that the workmen, who usually treat common scaffolding poles and planks very carelessly, do not throw these brackets and uprights about in their usual manner, as they are light and of convenient size for moving, and having found them to facilitate their labour, they soon prefer them to the heavier scaffolding poles.

This system has been adapted in Paris, to the construction and repairs, both external and internal, of dwelling-houses, with much success, and the author promises, on a future occasion, a description of this application of the principle.

The author then describes the machine for raising building materials, &c., which is intended to supersede carrying the bricks, &c., up ladders on the shoulders of men.

The machine consists of a strong frame standing on the ground, containing the winch wheel-work, on the second motion of which is a notched wheel; upon the scaffold above, is a frame supporting a similar notched wheel; around those two wheels is stretched an endless chain, composed of long flat links and transverse pins, which fall into and are held by the notches in the wheels. The hods for carrying the bricks and the mortar, and the buckets for the water, have each a hook upon them, which is placed upon the traversing pins of the chain; when, by the action of the wheel-work, motion is given to the chain, the hods, &c., are raised to the upper scaffolding, where they are received by the labourers and are conveyed to the bricklayers. The empty hods are hung on the descending side, and are detached below.

The author examined, carefully, the speed of the ordinary labourer's mode of delivering bricks at any considerable height, and then by experiment found, that the velocity at which the hods could be most conveniently received by the men, was when the chain travelled at the rate of about 15 feet in a minute; and upon that velocity he has based his calculations of the quantity of work which the machine can accomplish.

With one man turning the winch the machine will raise,—

10 feet high—90 bricks per minute = 5400 bricks per hour.
20 „ 45 „ = 2700 „
30 „ 30 „ = 1800 „
40 „ 22 „ = 1350 „
50 „ 18 „ = 1080 „
60 „ 15 „ = 900 „

Of course, if steam power, or several men, were employed at the winch, a greater quantity of materials would be raised in the same time.

At a small elevation, only a few hods are upon the chain together, but as the height increases, the upper frame is carried up with the scaffolding, the chain is lengthened, and more hods can be placed upon it.

It is stated, that by this machine, the men are relieved from the labour of climbing up the ladders; there is a corresponding diminution of risk from accidents; building operations can be carried on with greater expedition, and with a diminution in their cost.

The machine has been chiefly used by Messrs. Grissell and Peto, at the new Houses of Parliament; and by Mr. T. Cubitt, at the houses at the Albert Gate, Hyde-park, and it is much approved.

The paper is illustrated by two drawings, showing the details of the scaffolding and of the brick-raising machine.

Mr. Grissell approved of the machine, and had found it very serviceable at the Houses of Parliament. He intended to use it for erecting the Victoria Tower, and should there apply steam power to it, when he believed, that the economy of labour and time would be much greater than at present; but even now, it was a much cheaper and better mode of conveying materials to considerable heights, than by employing a large number of men, in the severe labour of carrying heavy hods up ladders. Another great advantage of the machine, was its doing away with much of the danger, not only of the men mounting the ladders, but also from encumbering the scaffolding with a weight of materials.

The President expressed to M. Journet, how much the members of the Institution appreciated every ingenious invention or useful application of machines, for economizing labour and reducing the cost of works, which were brought before the meetings by foreign engineers, or those who were connected with the execution of constructions. In the Institution, such communications would always be examined with impartiality, and with a desire to bring forward every really useful machine.

April 30, 1844.

The President in the Chair.

"Description of the method employed for repairing a chimney 120 feet high, at the Cotton Mill of Messrs. Couper, Glasgow." By Joseph Colthurst, Grad. Inst. C. E.

The way in which the tops of high chimneys have hitherto been repaired has been, either by erecting an outside scaffolding to the full height, or by incurring the, generally speaking, greater expense of stopping the works, and allowing the chimney to cool, and then sending a man up the inside, who, by fixing spars across, is able to ascend to the top.

To avoid the expense and inconvenience attendant on both these methods of proceeding, the author determined to adopt the following means:—

The man engaged to ascend was furnished with a broad leather belt, to which was attached a strong spring hook; ladder-irons were next provided, and the man then proceeded to drive them into the joints of the brickwork, at intervals of about 15 inches; then standing on one, and being hooked to that which was immediately opposite to his waist, he ascended, driving the ladder-irons in, one above the other, until he reached the top, from whence he removed some ornamental plates of iron which had been loosened by a storm, and which it was expected would be blown down on the buildings beneath, by the next gale of wind. The ladder-irons were taken out as the man descended.

The whole operation was performed in two days and a half, and would have occupied less time, if the smiths could have furnished the ladder-irons as quickly as they were required.

To ensure the safety of the man employed, a rope was passed up withinside all the ladder-irons, and was fastened to the belt round his waist and to a pin driven into the base of the chimney; this rope was, of course, payed out to him at each step as he ascended. It was also intended, in order to prevent the possibility of accident, that a cord should be fastened to the belt and then passed round the chimney, but the ladder-irons, when driven about six inches into the brickwork, were found to be so firm as to render both these precautions unnecessary.

Including a bonus of £5 to George Wilson, the man employed to execute the work, the whole cost of these repairs was under £13.

George Wilson is a native of Belfast, and since the repair of Messrs. Coupers' chimney, has practised the method described, as a sort of trade, and he has already ascended some of the highest buildings in the south of Scotland, amongst others the chimney of the Dalmuir Chemical Works, and Carrickfergus steeple.

The paper is illustrated by a drawing showing the chimney during the process of repair.

"Experimental researches into the properties of the Iron Ores of Samakoff, in Turkey, and of the Hæmatite Ores of Cumberland, with a view to determine the best means for reducing them into the cast and malleable states; and on the relative strength and other properties of cast-iron from the Turkish and other Hæmatite Ores." By William Fairbairn, M. Inst. C. E.

In the smelting and manufacturing of the poorer iron ores, as they are commonly called, being those in which a large proportion of alumina, silica, and other foreign matters are contained, many important improvements have in modern days been effected; but in the reduction of the richer sorts—hæmatite ores, those more nearly approaching pure iron, with very little admixture of other substances, there has been scarcely any change, from the old and expensive methods, which have for several centuries prevailed in this and other countries. It is remarkable that the proprietors of the richer minerals should have allowed the makers of iron, from ores of leaner quality, such as the blackband and kidney ores, to have so far outstripped them.

Except the successful experiments of Mr. Heath, at the Works of Porto Nuovo, in the East Indies, and the attempts now making by the Cleator Company, near Whitehaven, there are few instances of improvements in the smelting of rich ores, either in this country or on the continent. It has been stated, that the Swedish iron manufacturers have introduced some alterations into their works, but they appear to be of minor importance, and to be scarcely entitled to the name of improvements upon the old process used in that country for a long series of years.

It is to Mr. Ohanes Dadian, an active and enterprising Armenian, in the service of the Sublime Porte, that we are indebted for the present inquiry; and by that gentleman's determination to surmount every obstacle, and to solve the doubts of some eminent chemists, the present results were obtained. Amongst other duties devolving upon Mr. Dadian, in his recent visit to this country, was that of placing in the hands of competent persons, some samples of ores which were sent from Turkey, for the purpose of experiment. The first samples were small in quantity, but a more recent supply, accompanied with some specimens of bituminous coal, enabled the experimenters to enter upon the subject with increased confidence, and to pursue the enquiry with much greater prospects of success. In addition to this, Mr. Dadian had full power to engage persons duly qualified for the investigation, and whose skill and practical knowledge would entitle them to the support and confidence of their employers.

In consequence, Mr. W. N. Clay was engaged as chemist and metallurgist, and Mr. John Hague as engineer.

As the greater part of the experiments were conducted under the superintendence of those gentlemen, their separate reports are given in the order in which they were made; and to prevent confusion the facts are recorded as they occurred, from time to time, in the experiments.

Previous to Mr. Dadian's visit to England, he had collected information relative to the fuel, limestone, &c., in the district of country where the ore is found; and from the abundance and quality of the materials, it is presumed, that a moderately cheap iron of very superior quality may be obtained.

From the description of the country, as given by Mr. Dadian and by Mr. Zohrab, who visited the locality some years since, it appears, that the ore is brought down the rivers from the higher districts, and is deposited in the lower valleys, at a short distance from the sea; extensive tracts of country are thus covered, to a depth sufficient to ensure an almost inexhaustible supply.

Before any definite plan could be adopted for the reduction of the ores, it was deemed necessary to ascertain, by careful analysis, their composition and value, and for these objects Mr. Dadian, when last in Paris, consulted Monsieur Dumas, the chemist, and from that gentleman he received a favorable report: that report is not in the author's possession, but from statements received, it appeared only to have differed in a slight degree from that of Mr. H. H. Watson, of Bolton, whose analysis of the samples (which may be taken as a fair average of the whole) gave—

One atom 28 + one atom 8 = protoxide of iron.
Two atoms 56 + three atoms 24 = peroxide of iron.
84 32
84 metal + 32 Oxygen = 116 black oxide.

Then 116 : 84 : : 88 : 63·72 + quantity of metal per cent. in the ore in question by theory.

In this statement Mr. Watson observes, "that the oxide readily dissolves, when the ore is heated in powder with hydrochloric acid;" and by thus treating 100 grains of the ore, he obtained a solution of the oxide, and had 12 grains of siliceous earth undissolved; the proportions would therefore be—

Protoxide of iron Peroxide of iron	88
Siliceous earth . .	12
	100

From the above it is evident, that the ores are nearly pure oxides of iron; they are rich in quality, highly magnetic, and may be easily separated from extraneous matter by the magnet. In some of the processes this separation may or may not be necessary, but in case the silica be found injurious, the process of cleansing may be effected by a series of magnets fixed on the circumference of a wheel, which, in moving through the loose ore, would attract the iron and carry it round to a revolving brush, acting upon the periphery, and thus deposit the metal into a receiving box on the opposite side. This is probably the best method for obtaining the perfectly pure oxides; but the most expeditious mode would be to cleanse it with a fan, in the same way as farmers winnow grain, by blowing the lighter particles to a distance, and allowing the metallic granules, as being of higher specific gravity, to fall short into a separate receiver. A third method would be, to wash the ore in a current of running water, and thus free it from all superfluous matter not required in the process of manufacture. But in these different cleansing operations, an excess of the siliceous earths is assumed, and moreover that these mixtures are detrimental to the process of deoxidation, to be effected either before or after the change in the furnace.

Now, it is not altogether clear that such is the case, and in the absence of experiment it is reasonable to suppose, that instead of these earths proving injurious they might be found useful, in combining with the limestone as a flux, and thus vitrifying the silex at the same instant the deoxidating process is going on.

These opinions are entitled to some weight, as the separate reports of Mr. Clay and Mr. Hague (although their views are not altogether similar), still inculcate the necessity of adopting some effective process of deoxidation.

Before adverting to the experiments, it will be necessary briefly to state the opinions of several manufacturers, to whom the ores were submitted for inspection, and to whose sound practical views the country is indebted for many valuable improvements in the chemical as well as the mechanical process of the art.

To the iron-maker and engineer, a minute chemical analysis is of less importance than a knowledge of the methods used in the treatment of similar ores, derived from experimental and practical research. It is true, that none of the iron ores of this country will bear a comparison, in point of riches, with those of Turkey, excepting, probably, the red ores of Lancashire and Cumberland, which, although varying in their chemical compounds, are in other respects comparative, and exhibit (with the exception of the magnetic properties) characteristics of a very similar description.

According to Dr. Colquhon, of Glasgow, the Ulverstone ore contains—

	Grs.
Peroxide of iron	90·3
Silica	5·0
Alumina	3·0
Lime Magnesia	traces.
Water	6·0
	104·3

This, by calculation, would give an average of 62 per cent. of iron, of nearly the same degree of richness as the ores of Samakoff, which, from Mr. Watson's analysis, yields 63·72.

Dr. Colquhon, in his enquiry into Mr. Clay's new process, for making malleable iron direct from the ore, states, "that the red ores of Lancashire and Cumberland (which are a species of hæmatite), are exceedingly pure," and from an average sample, made up with great care, he found its constituents composed "of 62 per cent. of iron, 8 per cent. of earthy matter, and minute quantities only of lime and magnesia." In other respects the ores were entirely free from phosphorus, arsenic, and sulphur.

From this statement it is obvious, that the Ulverstone ores, operated upon by Dr. Colquhon, do not widely differ from those analyzed by Mr. Watson; and viewing their other properties, they may be considered to approximate, irrespective of the quantity of metal produced in each.

Concerning the other iron ores of this country, unfortunately none of them are analogous to those of Turkey, either as regards their chemical constituents, or the process by which they are reduced. It is the opinion of all the practical iron masters who have been consulted, that in smelting, the latter would require a different treatment from that pursued with the ores of this country; but in making malleable iron, they are all agreed as to its fitness for Mr. Clay's new process, and that large quantities of the finest quality might be made direct from the ore, at a moderate rate of charge.

On these points there is but one opinion, but the manufacturers are somewhat startled at the idea of a new process of preparation; the smelting being considered a work of difficulty, from the expense and trouble which must be incurred, before the preparatory process of roasting can be accomplished. In fact, these opinions would infer, that the whole must be looked upon, for some time to come, as an experiment, and that more particularly as the material to be worked upon is entirely new, and may present features of an exceedingly obdurate and refractory character. To a certain extent these views may be correct, as an excess of silex might prove exceedingly troublesome, and even with every care in the process of smelting, instead of a carburet (by which the melting pigs of this country are so well known, and so justly appreciated), a silicate of iron might be the result. It is true, that a flux of lime and a certain proportion of aluminous clay might remove, or in a great degree neutralize, the effects; but that can only be determined by experiment, and with such obstacles in advance, it will be necessary to guard against them, and to arrange future operations with a view to their removal.

But supposing them to be overcome either by this, or by the cleansing process already alluded to, or by such other means as may be deemed expedient, it is then to be considered, how the minute of the particles of the ore are to be retained in the furnace, during the application of a strong and intense blast. It is clear that some process of calcination must be adopted, in order, not only to deprive the ore of part of its oxygen in the first instance, but to effect its carburation, and to hold it together until it is fused. For these objects the following experiments were entered upon, under the directions of Mr. Clay and Mr. Hague.

The first operation was to convert one of the cupola furnaces (4 feet diameter) at the Canal Street Works, Manchester, into a blast furnace; this was effected, by lining it with fire-bricks to a height of 15 feet, leaving a hearth of 18 inches square, and 18 inches deep; it was made 2 feet 6 inches diameter at the boshes, and tapered to 18 inches at the top; with this furnace, and a moderately good fan blast, the experiments were made.

Previous to making the experiments at Manchester, Mr. Hague had tried the ores in various ways, and had subjected them to analysis and experiment. The first was made with only—

4	oz. of iron ore
4	oz. of chalk
3	oz. of bottle glass
¾	oz. of charcoal
½	oz. of clay
12¼	oz.

which, having been deoxidized in a close vessel, and melted in the crucible, produced a super-carburet of good No. 1 pig iron, and which worked freely under the chisel and file.

The next experiment was on a larger scale, and consisted of—

30	lbs. of iron ore
10	lbs. of bottle glass
8	lbs. of clay
48	lbs.

This, after being roasted, was pulverised, and mixed with water; it was then formed into bricks, and subsequently melted, with a limestone flux, in the cupola, by a fan blast, and produced a hard white iron, of a quality varying between No. 3 and No. 4 pigs.

The last experiment was repeated, with the addition of 2 lbs. of clay and 2 lbs. of common salt; 10 lbs. of scoria from the last melting, being substituted for the bottle glass. The produce of this mixture was a white No. 3 iron, nearly the same as the last.

Other tests of a similar kind were made, with nearly the same success, but no change of any moment occurred in the quality of the iron, until experiments on a more extended scale were adopted. These are given in the words of the experimenter.

"On the Iron Ore or Iron Sand of Samakoff in Turkey; and on the best means of reducing it into the states of cast and wrought iron, &c." By William Neale Clay, Director of Iron Mines and Works to the Sublime Porte.

UNDER the direction of Mr. Fairbairn, of Manchester, to whom the experiments on the Samakoff iron ores were entrusted, the writer was empowered to make such trials and experiments as, in his judgment, were most conducive to the full and perfect reduction of the ores, into the cast and malleable states. Acting upon these instructions, no time was lost in making the necessary preparations; and from the facilities afforded, both at Manchester and the Backbarrow Iron Works, near Ulverstone, the most satisfactory results were obtained.

It would appear, that on a small scale, and at a great sacrifice of time, fuel, and labour, this ore had been long used by the natives, for the production of small quantities of wrought iron, by the ordinary primitive method;—namely, the mixture of the ore with charcoal in a deep hearth, and the employment of a weak blast.

The casting of ordnance being a great object with the Ottoman Government, more recent attempts had been made to convert the ore into cast iron, but without success; or at all events with so little, as only to produce a white iron, quite incapable of being remelted for common purposes. Very meagre information was obtained, as to how or where the attempts had been made; it being merely stated that every means had been tried, and that the iron produced could not be recast, even into a cannon ball. That these trials had been made in various countries, but always with like results, and the continuous failure in the production of iron fit for remelting, seemed to have produced a conviction, that there was something inherent in the ore, which prevented its being reduced, by any means, into cast iron, of good, or even of common quality.

From the information obtained, it appears that the supply of this beautiful ore in the lower valleys of Roumelia, at a short distance from the sea, is almost inexhaustible. Although much smaller in its crystals than the celebrated Wootz ore from Porto Nuovo, in the East Indies, it is so similar, that probably, like it, it may be found in the mine, mechanically combined with quartoze crystals;—if so, nature has nearly purified it, by the action of the torrents, which have brought it from its bed; for when it is deposited in the valleys, the small portions of silex still commingled with the ore, are readily separable by many mechanical means.

In appearance, it very much resembles the titaniferous iron ores, and Mr. Henry Hough Watson, of Bolton, on being shown a specimen, expressed his conviction, that he should find considerable quantities of that metal, as he had done in other samples of a similar appearance; but this proved not to be the case—no trace whatever could be detected of titanium. When freed from its accompanying siliceous earths, which amount to 12 per cent., it yields 72·4 per cent. of iron, a quantity which denotes its extreme purity; being the richest form in which the ore is ever found in quantity. When combined with the silex, the yield, by analysis, is 63·7 per cent., which is very nearly what was obtained by fusion with carbonaceous matter, and a flux, in the crucible.

Among the parties consulted, a difference of opinion has existed, as to the necessity of having the silex separated. Some contending, that when vitrified by a due proportion of lime, the resulting glass was rather advantageous; while others maintained, that such a glass was not obtainable from silex and lime alone, and that the presence of the former, unaccompanied by clay, rendered many ores of iron comparatively valueless, there being much difficulty in reducing the silicated oxides of iron, which such ores would form, when exposed, *per se*, to a high temperature.

It appeared to the author, that the investigation of the phenomena, attendant on the fusion of the earths generally found commingled with iron ores, was of the greatest importance, and that much of the successful practice of iron smelting, depended on the proper vitrification of these earths; that an important analogy existed between the manufactures of glass and of pig iron, and that in order to accomplish successfully the production of the latter, it would be necessary to study the theory of the former. When this was done, he conceived that, more particularly with reference to the richer descriptions of ores, the mists which were generally supposed to envelope the manufacture of pig iron, must be rapidly dispelled before the advancing light of science, and that many results, now looked upon as unaccountable phenomena, would be reduced to their more rational position, as calculable effects from appreciable causes.

The author believes he may claim priority of discovery, as being the first to point out the true atomic character of glass, or rather, that the quality of that production depended on its being formed of ingredients, which were compounded in certain definite atomic proportions. This result he arrived at (as nearly as he can recollect) in the year 1835, when connected with the establishment of Messrs. Chance and Hartley, near Birmingham. The making of crown or window glass at that period, like the making of pig iron at present, was looked on as a sort of manufacturing lottery, and the "fonder" or glass smelter, who managed the furnace, was an important person, who responded to complaints of any badness of quality in the glass, by laying upon the furnace all the blame of the defects. The consequence was, that the manufacturer was constantly oscillating between excesses of soda and lime, respectively, as "ambittiness"[*] or "cord"[†] preponderated; the former being a symptom of too much lime, the latter of too much soda. The author obtained the mixtures which had made the very best glass, and after much laborious investigation and study of the several decompositions, that would take place, came to the conclusion, that this description of glass was a quinque-silicate of lime and soda. On this hypothesis, he obtained from Mr. Richard Phillips, analyses of the several materials used, and by compounding them in the above proportions, found, that five atoms of silica, or say 80 pounds, with one atom of pure carbonate of soda, say 54 pounds, and five atoms more of silica to one of carbonate of lime, say 50 pounds, or such quantities of the commercial articles as contained these proportions, universally and without an exception, produced a beautiful transparent glass, free from all the evils of the old system.

The pots, which previously were stopped working at two-thirds of their depth, were then cleared out to the bottom; the immaculate "fonder" was dethroned, and his excuse 'of the furnace's whims' was no longer allowed. From glass thus made, in conjunction with the late esteemed Dr. Ritchie, the author produced lenses for optical purposes, of great size and purity; he believes, that the death of that gentleman, alone prevented the more perfect accomplishment of this great desideratum in science; and he takes this opportunity of expressing his humble conviction, that optical glass will never be successfully produced, except upon such principles.

In conjunction with Mr. Denham Smith, he soon after took out a patent, for the employment of barytes as a solvent of silica, and the first trial, on a practical scale, proved the soundness of the theory; for one atom of carbonate of barytes, say 98 pounds, with five of silica, or 80 pounds, made a true and beautiful glass, in combination with the previously named proportions of soda, lime, and silica.

But there exists this peculiarity about the silicates of lime and barytes, that, *per se*, and even when combined together, they make a very infusible glass; that made with lime, more particularly, is viscid and opaque, except at an extremely high temperature. If glass bottles were produced from lime and sand alone, a few, only, could be made from the top of the pot, while the "metal" was hot; its cooling would cause the succeeding articles to be more and more filled with "stones" or "knots," till the whole mass would become opaque and unworkable. This, in his opinion, demonstrates the necessity of having another neutralizer of the silicic acid, in the smelting of iron ores, which, when of a purely siliceous character, are found very refractory, if lime alone be used as a flux.

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[*] "Ambittiness" denotes the presence of small opaque particles.

[†] "Cord" is a striated line, distorting objects when the pane of glass is looked through.

The glass bottle makers however, soon found that clay (brick clay was the best for black bottles) formed the best, because the cheapest ingredient, to add to the lime, as a co-neutralizer of the silica. The author regrets, that he had no opportunity of accurately investigating what compound of silicate of alumina is most fusible, but from the fire clays containing a great proportion of the latter, he thinks it is very probable, that here also, a quinque-silicate may prove the most fusible compound; that is, in opposition to the fire clays, a small proportion of alumina to a large one of silica. Before this can be accurately determined, the higher order of chemists have to decide on the atomic number of alumina, which at present seems unsettled; when that is done, he has no doubt that a quinque-silicate of lime and alumina will be found the best glass or scoria for the manufacturer of iron to produce, flowing more readily, and releasing the oxide of iron, which some unappropriated silex might have formed a connection with, to a more profitable combination with the carbon of the fuel.

The accurate experiments of Mr. Mushet, and the practical views he deduced therefrom, satisfied him, that lime alone was insufficient, as a flux, for siliceous iron stones, and the practice of the Backbarrow Company, now nearly the only smelters of iron with wood charcoal in the kingdom, is, to introduce an iron stone, from the Workington Coal Mines, the alumina of which supplies the desired proportion; hence their "cinder" bears the character of a true glass;—homogeneous and transparent, except when slightly tinged by charcoal.

The author has gone thus far into the exclusive subject of the vitrification of silex, because that article seems, by analysis, to be the only adulterative matter commingled with the Turkish ore. He considers, therefore, that it is necessary to be separated as far as possible, and if 2 or 3 per cent. (as is probable) still remained, that with lime (if it contains no alumina itself) a small portion of clay should be added. If "natron" be obtainable at a very cheap rate, its soda would, with the lime, occasion a more rapid and fluid fusion of the silex; in this case, if clay be not readily obtainable, none would be requisite.

NEW METHOD OF BLASTING ROCKS, BY MEANS OF GUNPOWDER.

BY M. COURBEBAISSE.

This method consists in forming in rocks to be blasted, cavities or mines, of any required size, according to the effect desired to be produced, instead of the small cylindrical holes ordinarily employed, which do not admit of much variation in size.

An experienced miner will be able to judge, upon careful examination, according to the size and nature of the mass of rock to be removed, the most convenient situation and size of the cavities required to effect the object. This having been ascertained, a cylindrical hole, either vertical or inclined, is made in the ordinary manner, at each place where it is thought requisite, and this is afterwards enlarged, either by any chemical agents, which will have the effect of destroying the rock, or by mechanical means.

Whatever may be the means employed, a large quantity of powder can be lodged in this way cheaper than in small cylindrical holes, and less expense is incurred for ramming and firing than for the same quantity of powder lodged in small holes. Besides, the powder, being in large quantities, and under greater pressure, burns better, gives out more heat, and produces a more powerful effect than if divided into small quantities.

The experiments made by the inventor have realised his expectations; they were made upon a calcareous rock, in which he formed the cavity to receive the powder by means of a chemical agent (hydrochloric acid); the rock being detached in larger masses by this mode of applying the powder than by the old method, the blocks are not thrown off with force, but only moved a short distance. As the gases evolved by the combustion of the powder do not escape into the atmosphere until they have expanded to their fullest extent, they do not detonate.

When the cavity has been produced in the calcareous rock, by the effect of the hydrochloric acid (which is poured therein three several times through a copper funnel about three yards long, and water afterwards added thereto; and is allowed to act upon the rock for two hours) it is emptied by means of small vessels of the same diameter as the hole, and from four to five inches in height, which act in a similar manner to pump-buckets, being furnished with valves opening upwards. It is afterwards dried, by stuffing it with tow, which is turned about and drawn out.

In order to charge, the powder is poured in until the cavity is two-thirds full; upon this, one of Bickford's fuses is placed; the other third part of powder is then poured in, and the hole is then filled up with sand,—after which the fuse is ready to be lighted. The explosion takes place without either flash or detonation, or scattering the materials; a dead sound only is heard, arising from the cracking of the rock, and only a slight trembling of the mass is perceived, which is suddenly raised a very little distance, and falls again, cracked in every direction.

The operation by these improved means only costs about five pence per square yard, whilst by the ordinary method it costs from 2*s*. 6*d*. to 3*s*. 6*d*.—[*Acad des Sciences.*]

MODE OF PURIFYING LINSEED OIL.

About 2 lbs. of sulphate of iron (green vitriol) are dissolved in about 3 quarts of rain water, and the solution is poured into a large bottle, containing 2 lbs. of raw linseed oil. The mixture is then exposed to the light, and stirred once or twice a day, during a month or six weeks,—at the expiration of which time, the linseed oil will be well purified and bleached; all the mucilaginous matter it contained being precipitated in the solution of sulphate of iron. The oil is then gently decanted from the solution, and it will be found perfectly white, free from extraneous matter, and of a good drying quality. The sulphate of iron employed may serve for fresh operations; for which purpose, it is only necessary to filter the solution, and afterwards to evaporate and crystallize it.—[*Journal des Usines.*]

Scientific Adjudication.

COURT OF CHANCERY, WESTMINSTER.

May 28*th*, 1845.

THE QUEEN *v.* NEWTON.

This case was specially appointed to be heard before the Lord Chancellor, assisted by the Master of the Rolls, at the opening of the Court. It was an application to compel the defendant to bring into Court a certain patent, to have the same cancelled, and the seal cut therefrom.

Mr. Hindmarsh, for the plaintiff, stated, that the defendant, who is well known to the Court as a patent agent and civil engineer, had obtained letters patent on the 22nd of February, 1841, for "improvements in the process of, and apparatus for, purifying and disinfecting greasy and oily substances or other matters, both animal and vegetable;" the invention having been communicated to him by a foreigner residing abroad. And that in due time and form the defendant had, in accordance with a proviso in the grant, inrolled a specification, setting forth the features and details of the said alleged new invention communicated to him.

But it appeared to Messrs. Wilson & Co. (who are extensively engaged in the tallow trade), after having investigated the claims set up under the said patent, that parts of the process had been known and used in this country before the date of the patent, and that, therefore, it ought not to have been granted. In consequence of this a writ of *scire facias* was issued to try the question, whether the Crown ought not to repeal the letters patent? This question was tried before Lord Chief Justice Denman, in the Court of Queen's Bench, in December, 1844,* and defendant not being authorised by the proprietor of the patent (resident in Paris) to defend this action, judgment was awarded, that the patent must henceforth be considered to be null and void. Notwithstanding this decision of the Court of Queen's Bench, it was thought desirable that the patent itself should be brought into the Court of Chancery, and delivered up to be cancelled. Some discussion then ensued between the learned lords and the counsel, as to whether the Court of Queen's Bench had any right to order a superior court to act in this matter? The original inrolment of the patent had not been taken from the Chancery into the Court of Queen's Bench, but only a recital of it produced there. The Lord Chancellor and the Master of the Rolls enquired, where the learned counsel found precedents for their present application? It was admitted, that there was no case upon record exactly similar to that before the Court; but one bearing upon the point, occurred in the reign of Edward III., in reference to a charter granted to the Friars Carmelites; this charter had been annulled by the Court of King's Bench, and the Friars were ordered to take the patent into the Court of Chancery (from whence it had issued), there, according to form, to be *cancellated*, crossed with lines, and the great seal broken and cut off. The application to the Court of Chancery, therefore, was, that the defendant be compelled to bring the patent into Court, and deliver it to be so cancellated and destroyed. This application had been notified to the defendant some time back, and his not having thereon appeared, the present day had been specially appointed for him to come before the Court with the said letters patent. It was urged by Mr. Hindmarsh, that the defendant Newton having still failed to comply with the order, he ought now to be committed to prison for contempt.

Mr. Webster, in support of the motion, urged that it was important the patent should be officially destroyed; for the defendant might, notwithstanding the verdict on the writ of *scire facias*, go about the country with his patent in his hand, alarming people with the threat of legal proceedings if they used any part of the process which he claimed; and since the recent Act of

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* For account of this Trial, see Vol. XXV., p. 416.

Lord Brougham, he might disclaim the objectionable parts of this patent, and restore it to a valid state. He therefore urged the Court to compel the defendant to comply with the order.

The Lord Chancellor wished to know by what process they considered he could compel the defendant to bring the patent there? he knew of none. It was admitted no case in point could be found; the learned counsel, however, in an elaborate argument, upheld the propriety of the motion, and urged that his lordship should now make an order as a precedent; this appearing to be the first instance in which the subject had been mooted before the Court.

Mr. Wakefield, on the part of the defendant Newton, said, the motion called upon him to do that which was totally out of his power to comply with. He, the defendant, had no interest in the patent whatever, nor in the matter before the Court, further than in reference to his own costs in defending himself against this motion, and of which he was satisfied he should never be repaid. The patent had been obtained by him, at the instance of a correspondent in France, on behalf of a Mr. Debronfont; and immediately after the patent had been obtained, it was forwarded to the foreigner in Paris, and a specification of the invention inrolled, literally, as he received it From that time the defendant has never seen the patent, and although he had made repeated applications to the inventor, could get no reply whatever. He, the defendant, therefore, had not the letters patent in his possession, and could not obtain them to deliver up, as required.

After some further discussion, it was decided, that the inrolment of the patent should be cancelled; that a *vacator* should be entered on the roll; and that the defendant should undertake to bring no writ of error, or make any assignment of the patent.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1845.

Apr. 28. *William Ridding & Richard Groves*, of Walsall, for a safety mouth guard bit.

30. *Brown & Green*, of Luton, Bedfordshire, for an improved kitchen range.

May 1. *James Dixon & Sons*, of Cornish-place, Sheffield, for a syphon coffee filterer.

5. *John Young and Robert Boyle*, of Ayr, for an improved draining tile and sole machine.

7. *John Soden Holbeche*, of Sutton Coldfield, Warwickshire, for a bench plane iron.

9. *Augustus Septimus Braithwaite*, of Lamb's Conduit-street, London, for a portable taper holder.

10. *James Chadley*, of 28, Berkeley-street, Connaught-square, for the screw-horse shoe, &c., caoutchouc pad.

13. *Miguel Theodore de Folly*, of 29, Harrington-street, Hampstead-road, and 8, Lowther Arcade, Strand, for a geometrical key-board for the piano-forte.

14. *John Windsor*, of 2, Meredith-street, Clerkenwell, for a carving knife.

14. *Francis Spink Cooper*, of Bishopwearmouth, in the county of Durham, for an internal deflecting chimney-top or ventilator.

15. *Samuel Scattergood*, of 32½, Livery-street, Birmingham, for a new sliding-handle for surveyors' and other measuring tapes.

19. *John Henderson*, of the Planes, Bishopwearmouth, Durham, for a machine for making tiles.

20. *Benjamin Skidmore*, of Prince's End, Tipton, Staffordshire, for a pumping engine.

20. *Bentley & Bailey*, of Bedford, for an improved irrigator.

22. *Henry Lamplough*, of 88, Snow-hill, for a stock or stiffener.

23. *Joseph Biggs & William Bowmar*, of Leicestershire, for an instrument to fold the sides of the fingers of gloves.

24. *William Day*, of 353, Strand, for a portable shower-bath.

26. *W. & J. Galloway*, of Manchester, for a design for the shape or configuration of internal flues in a steam-engine boiler, having for its object the consumption of smoke.

29. *Joseph Willington Lane*, of Witney, for the American cooking stove.

List of Patents

That have passed the Great Seal of IRELAND, to the 15*th of May*, 1845, *inclusive.*

To James Fisher, the younger, of Radford Works, in the parish of Radford, in the county of Nottingham, Gent., and James Gibbons, of New Radford, in the said parish of Radford, machinist, for certain improvements in the manufacture of figured or ornamented lace or net, and other fabrics.—Sealed 22nd April.

William Prosser, jun., Esq., of Pimlico, and Jean Baptiste Carcano, of Milan, Gent., for improvements in working atmospheric railways,—being a communication.—Sealed 29th April.

Alexander Turnbull, of 48, Russell-square, in the county of Middlesex, Doctor of Medicine, for a new mode or method of more expeditiously and effectually tanning hides and skins, and of extracting and separating the catechuic acid from the tannic acid in the catechu, or terra japonica, used in tanning. Sealed 15th May.

List of Patents

Granted for SCOTLAND, subsequent to April 22*nd*, 1845.

To Charles Louis Felix Franchot, of Paris, engineer, for improvements in air-engines.—Sealed 28th April.

John Herbert Blakey, of Dundee, Forfarshire, flax spinner, for improvements in spinning throstles.—Sealed 30th April.

Elijah Galloway, of the Strand, London, engineer, for improvements in propelling railway carriages.—Sealed 30th April.

James Caldwell, of Broad-street, Ratcliff, in the county of Middlesex, for improvements in capstans, windlasses, and machinery for raising and lowering weights, and also in ships' riding bits.—Sealed 30th April.

James Bazley, jun., of Manchester, cotton spinner, for certain improvements in tube flyers, used in machinery for roving and slubbing cotton and other fibrous substances.— Sealed 2nd May.

Henry Phillips, of Clist Honiton, in the county of Devon, chemist, for improvements in purifying gas.—Sealed 5th May.

John Coope Hadden, of Liverpool-street, King's-cross, in the county of Middlesex, civil engineer, for improvements in preparing sleepers, chairs, and spikes, and constructing wheels for railways.—Sealed 5th May.

John Sylvester, of Great Russell-street, Bloomsbury, civil engineer, for improvements in stoves and fire-places.—Sealed 7th May.

Henry Borriskill Taylor, of Piccadilly, lamp manufacturer, for improvements in apparatus for transmitting light from lamp and other burners.—Sealed 7th May.

Thomas Russell, of Kircaldy, Fifeshire, iron-founder, and John Peter, jun., of Kirkland Works, in the said county, for certain improvements in flax spinning, and flax spinning machinery, which are also applicable to the manufacture of other fibrous substances.—Sealed 8th May.

James Lamb Hancock, Frederick Augustus Lamb Hancock, and William Lamb Hancock, of the parish of Guildsford, Montgomeryshire, for an improved rotatory engine.—Sealed 13th May.

Thomas Brown Jordan, of College-road, Pimlico, London, mathematical divider, for improvements in machinery and apparatus for cutting, carving, and engraving.—Sealed 22nd May.

Frederick Ransome, of Ipswich, engineer, for improvements in the manufacture of artificial stone for grinding and other purposes.—Sealed 22nd May.

George Spencer, of Hungerford-street, West Strand, London, engineer's draftsman, for improvements in propelling vessels on inland waters.—Sealed 22nd May.

New Patents

SEALED IN ENGLAND.

1845.

To Samuel Wilkes, of Wolverhampton, Staffordshire, iron-founder, for improvements in the manufacture of hinges. Sealed 26th April—6 months for inrolment.

John Sylvester, of Great Russell-street, Bloomsbury, civil engineer, for improvements in stoves and fire-places. Sealed 29th April —6 months for inrolment.

William Gilmour Wilson, of Earl-street, engineer, for improvements in the construction of wheels for carriages. Sealed 29th April—6 months for inrolment.

William Maugham, of Newport-street, consulting chemist, and Archibald Dunlop, the younger, of Upper Thames-street, Gent., for improvements in the manufacture of ale, porter, and other fermented liquors. Sealed 29th April—6 months for inrolment.

Frederic Lesnard, of Keppel-street, Middlesex, engineer, for improvements in generating steam, and evaporating liquids. Sealed 29th April—6 months for inrolment.

James Nasmyth, of Arundel-street, Middlesex, Gent., for certain improvements in engines or machines for obtaining and applying motive power. Sealed 29th April—6 months for inrolment.

John Herbert Blakey, of Dundee, flax spinner, for improvements in spinning throstles. Sealed 29th April—6 months for inrolment.

John Read, of Regent's-circus, mechanist, for certain improvements in machinery or apparatus for raising and forcing fluids. Sealed 29th April—6 months for inrolment.

James Ambler, sen., of Manningham, Yorkshire, manufacturer, for improvements in preparing and combing wool. Sealed 1st May—6 months for inrolment.

James Darnell, of Belmont, Ramsgate, Gent., for improvements in machinery for beating and brushing carpets. Sealed 1st May—6 months for inrolment.

James Francis Pinel, of Skinners-placc, Size-lane, chemist, for certain improvements in the mode of treating farinaceous substances. Sealed 1st May—6 months for inrolment.

Richard Prosser, of Birmingham, civil engineer, for improvements in the manufacture of metal tubes, and in the machinery and apparatus for producing the same. Sealed 1st May—6 months for inrolment.

Frederick George Underhay, of Wells-street, Gray's-inn-road, brazier, for improvements in taps and valves, Sealed 3rd May —6 months for inrolment.

Charles Attwood, of Bishop Oak, near Walsingham, Durham, Esq., for certain improvements in manufacturing iron. Sealed 3rd May—6 months for inrolment.

William Radley, of Laburnum-terrace, Kingsland-road, Middlesex, engineering chemist, for certain improvements in the production of gases, and for their application to purposes of general illumination; and in the apparatus and machinery to be employed in manufacturing, measuring, and distributing the same. Sealed 3rd May—6 months for inrolment.

William Brindley, of Liverpool-road, paper-manufacturer, for improvements in the manufacture of trays, and other japanned wares, and various articles of japanners' and other ware, made of pulp. Sealed 3rd May—6 months for inrolment.

James Foreman, of Ranelagh-road, for certain improvements in the construction and manufacture of pipes and tubes, applicable to locomotive purposes, and to the conveyance of water, gas, and other fluids,—being a communication. Sealed 6th May —6 months for inrolment.

Charles Wheatstone, of Conduit-street, Middlesex, Esq., and William Fothergill Cooke, of Kidbrooke, Blackheath, Esq., for improvements in electric telegraphs, and in apparatus relating thereto; part of which improvements are applicable to other purposes. Sealed 6th May—6 months for inrolment.

Joseph Hill, of Ipswich, Suffolk, wire-worker, for improvements in manufacturing wire fabrics for blinds, and other uses. Sealed 6th May—6 months for inrolment.

Joseph Burch, of Craig Works, Macclesfield, Cheshire, calico printer, for improvements in machinery for printing calico and other fabrics; part of which improvements is applicable to other purposes where resistance to heat is required. Sealed 6th May—6 months for inrolment.

Albert Daniel Hindley, of Berners-street, Oxford-street, carpet manufacturer, for improvements in the manufacture of carpets and other piled fabrics. Sealed 6th May—6 months for inrolment.

Joseph Amesbury, of Devonshire-street, Portland-place, surgeon, for improvements in apparatus for the relief or correction of stiffness, weakness, or distortion in the human body. Sealed 6th May—6 months for inrolment.

George Duckett Barber Beaumont, of Sandy-combe Lodge, Twickenham, for improvements in propelling carriages. Sealed 8th May—6 months for inrolment.

John M'Intosh, of Glasgow, Gent., for improvements in preparing materials for coloring and printing calicoes, and other fabrics, and improvements in printing and ornamenting fabrics. Sealed 8th May—6 months for inrolment.

William Prosser, jun., of Pimlico, Esq., and Jacob Brett, of Hanover-square, both in the county of Middlesex, for improvements in railways, and in propelling railway carriages. Sealed 10th May—6 months for inrolment.

John Mellar Chapman, of Newcastle-upon-Tyne, banker, for improvements in the manufacture of rails and other parts of railways. Sealed 10th May—6 months for inrolment.

George Fergusson Wilson, of Belmont, Vauxhall, Gent., and George Gwynne, of Regent-street, Gent., and James Pillans Wilson, of Belmont, Vauxhall, aforesaid, Gent., for improvements in treating certain inflammable matters, and in the manufacture of candles and soap. Sealed 10th May—6 months for inrolment.

Frederick Ransome, of Ipswich, engineer, for improvements in combining small coal and other matters, and in preserving wood. Sealed 10th May—6 months for inrolment.

John Parsons, of Stones-row, St. Pancras, machinist, for certain improvements in the manufacture of fuel, and in apparatus for the use of the same. Sealed 10th May—6 months for inrolment.

Charles James Smith, of Birmingham, for certain improvements in artillery, guns, pistols, and other fire-arms, and in the apparatus to be used therewith. Sealed 14th May—6 months for inrolment.

John Henry Pape, of New Bond-street, piano-forte manufacturer, for improvements in musical instruments. Sealed 17th May—6 months for inrolment.

Apsley Pellatt, of Falcon Glass Works, Holland-street, glass manufacturer, and Frederick Pellatt, of Blackheath, Gent., for improvements in the manufacture of glass, and in casting, rolling, moulding, blowing, and drawing glass. Sealed 17th May—6 months for inrolment.

Thomas Wells, of Ware, Hertfordshire, whitesmith, for improvements in the construction of timber and other jacks and floor cramps. Sealed 17th May—6 months for inrolment.

Alexander M'Dougall, of Daisy Bank, Manchester, Gent., for certain improvements in the method of working atmospheric railways. Sealed 17th May—6 months for inrolment.

Louis Antoine Ritterbandt, of Gerrard-street, Doctor of Medicine, for certain improvments in the application of heat to boilers, for generating steam; which improvements may be also applied to other purposes where heat is required. Sealed 17th May—6 months for inrolment.

Christopher Nickels, of York-road, Lambeth, Gent., for improvements in binding and covering books, pamphlets, portfolios, writing cases, and other similar articles. Sealed 20th May—6 months for inrolment.

James Fletcher, of Manchester, machine maker, for certain improvements in machinery or apparatus for preparing, roving, and slubbing cotton and other fibrous substances. Sealed 22d May—6 months for inrolment.

Charles Joseph Hullmandel, of Great Marlborough-street, lithographer, for certain improvements in producing patterns upon earthenware and porcelain. Sealed 22nd May—6 months for inrolment.

Thomas Bazley, jun., of Manchester, cotton spinner, for certain improvements in tube flyers, used in machinery for roving and slubbing cotton and other fibrous substances. Sealed 22d May —6 months for inrolment.

James Heath Lewis, of Dover, printer, for certain improvements in printing. Sealed 22nd May—6 months for inrolment.

Edward Wilkins, of Blue Anchor road, Bermondsey, tanner, for an improvement or improvements in the manufacture of leather. Sealed 22nd May—6 months for inrolment.

Pierre Armand le Comte de Fontainemoreau, of Skinners-place, London, for certain improvements in dissolving and separating the oxides from the metals and metallic substances,—being a communication. Sealed 22nd May—6 months for inrolment.

Augustus Septimus Braithwaite, of St. Martin's-le-Grand, London, Gent., for certain improvements in buckles, clasps, aud other fastenings,—being a communication. Sealed 22nd May—6 months for inrolment.

Robert Kerr, of Thread-street, Scotland, manufacturer, for certain improvements in hand-loom weaving, and for producing a double fabric of raised figure work in the same loom, by one process of weaving. Sealed 22nd May—6 months for inrolment.

James Clark, of Glasgow, power-loom weaver, for improvements in the manufacture of fabrics from fibrous materials. Sealed 22nd May—6 months for inrolment.

Michel Boche, of Paris, manufacturer, for improvements in apparatus for measuring charges of powder and shot. Sealed 22nd May—6 months for inrolment.

James Napier, of Hoxton, dyer, for improvements in treating mineral waters to obtain products therefrom, and for separating metals from other matters. Sealed 22nd May—6 months for inrolment.

Richard Coleman, of Colchester, iron-founder, for improvements in the construction of harrows and sheep folds. Sealed 22nd May—6 months for inrolment.

Henry Deacon, of Eçcleston, engineer, for improvements in apparatus for grinding and smoothing plate-glass, crown-glass, and sheet-glass. Sealed 22nd May—6 months for inrolment.

Jeremiah Simpson, of Burslem, oven builder, and Joshua Seddon, of Burslem, aforesaid, earthenware manufacturer, for an improved method of constructing the flues and interior arrangements of ovens and kilns, used by manufacturers of china and earthenware.—Sealed 24th May—6 months for inrolment.

Richard Fell, of No. 54, Crown-street, Finsbury, Middlesex, plumber, for certain improvements in the generation and application of steam, and in obtaining and applying motive power. Sealed 24th May—6 months for inrolment.

Julius Adolph Detmold, of the City of London, merchant, for improvements in the construction of metallic boats and other vessels, having curved surfaces,—being a communication. Sealed 24th May—6 months for inrolment.

John Constable, of the City of London, merchant, for certain improvements in the manufacture of gas for lighting and heating, —being a communication. Sealed 24th May—6 months for inrolment.

William Prosser, jun., Esq., of Pimlico, and Jean Baptiste Carcano, of Milan, Gent., for improvements in working atmospheric railways,—being a communication.—6 months for inrolment.—Sealed 18th December, 1844.

Henry Pinkus, of 51, Great Marlborough-street, Esq., for improvements in obtaining and applying motive power to impelling machinery.—6 months for inrolment.—Sealed 27th December, 1844.

[The two last patents being opposed at the Great Seal, were not sealed till the 24th May, 1845, but bear date the day they would have been sealed, had such opposition not have been entered, per order of the Lord Chancellor.]

CELESTIAL PHENOMENA FOR JUNE, 1845.

D.	H.	M.	
1			Clock after the sun, 2m. 31s.
	—		☽ rises 1h. 53m. M.
	—		☽ passes mer. 9h. 9m. M.
	—		☽ sets 4h. 37m. A.
	13	26	♂ in conj. with ♄ diff. of dec. 2. 4. S.
	14	41	♃'s third satt. will em.
2	12	1	☿ in conj. with the ☽ diff. of dec. 4. 23. S.
4	3	25	☿ greatest elong. 23. 49. W.
5			Clock after the sun, 1m. 52s.
	—		☽ rises 4h. 13m. M.
	—		☽ passes mer. 0h. 21m. A.
	—		☽ sets 8h. 28m. A.
	1	8	Ecliptic conj. or ● new moon
		45	♀ in conj. with the ☽ diff. of dec. 2. 29. N.
6	11		☽ in Apogee
7	9	51	☿ greatest hel. lat. S.
10			Clock after the sun, 0m. 56s.
	—		☽ rises 9h. 7m. M.
	—		☽ passes mer. 4h. 12m. A.
	—		☽ sets 11h. 4m. M.
	14	30	♃'s first satt. will. im.
13	3	43	☽ in □ or first quarter
15			Clock before the sun, 0m. 5s.
	—		☽ rises 2h. 58m. A.
	—		☽ passes mer. 8h. 8m. A.
	—		☽ sets 0h. 32m. M.
17	14	25	Juno in the ascending node
18			Mercury R. A. 4h. 27m. dec. 20. 7. N.
	—		Venus R. A. 6h. 26m. dec. 24. 6. N.
	—		Mars R. A. 21h. 53m. dec. 16. 53. S.
	—		Vesta R. A. 3h. 1m. dec. 11. 36. N.
	—		Juno R. A. 10h. 15m. dec. 10. 49. N.
	—		Pallas R. A. 20h. 37m. dec. 17. 57. N.
	—		Ceres R. A. 22h. 44m. dec. 19. 39. S.
	—		Jupiter R. A. 2h. 5m. dec. 11. 30. N.

D.	H.	M.	
	—		Saturn R. A. 21h. 25m. dec. 16. 11. S.
	—		Georg. R. A. 0h. 37m. dec. 3. 18. N.
	—		Mercury passes mer. 22h. 44m.
	—		Venus passes mer. 0h. 40m.
	—		Mars passes mer. 16h. 5m.
	—		Jupiter passes mer. 20h. 16m.
	—		Saturn passes mer. 15h. 36m.
	—		Georg. passes mer. 18h. 48m.
19	11	18	Ecliptic oppo. or ○ full moon
	17		☽ in Perigee
19			Occul κ1, Sagittarii, im. 15h. 56m. em. 16h. 50m.
20			Clock before the sun, 1m. 9s.
	—		☽ rises 8h. 42m. A.
	—		☽ passes mer. 0h. 3m. M.
	—		☽ sets 4h. 19m. M.
			Occul. *d* Sagittarii, im. 15h. 37m. em. 16h. 0m.
21	2	48	☉ enters Cancer, Summer com.
22	22	24	♄ in conj. with the ☽ diff. of dec. 6. 30. S.
23	14	19	♂ in conj. with the ☽ diff. of dec. 9. 59. S.
25			Clock before the sun, 2m. 13s.
	—		☽ rises 11h. 12m. A.
	—		☽ passes mer. 4h. 46m. M.
	—		☽ sets 10h. 55m. M.
			Occul. 22 Piscium, im. 12h. 42m. em. 13h. 45m.
26	8	27	☽ in □ or last quarter
26	8	49	☿ in the ascending node
	12	46	♃'s first satt. will. im.
	16	41	♅ in conj. with the ☽ diff. of dec. 4. 38. S.
28	14	50	♃ in conj. with the ☽ diff. of dec. 3. 2. S.
30			Clock before the sun, 3m. 15s.
	—		☽ rises 0h. 54m. M.
	—		☽ passes mer. 8h. 41m. M.
	—		☽ sets 4h. 37m. A.
	18		♀ in Perihelion
22	22		☿ in Perihelion

J. LEWTHWAITE, Rotherhithe.

THE

LONDON JOURNAL,

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CONJOINED SERIES.

No. CLXII.

RECENT PATENTS.

To Thomas Fuller, *of the firm of Wm. Collier & Co., of Manchester, in the county of Lancaster, engineer, for certain improvements in machinery, tools, or apparatus for turning, boring, and cutting metals and other substances.*—[Sealed 29th October, 1844.]

This invention consists in a novel arrangement of mechanism for performing the several operations of turning, boring, sliding, screw-cutting, and wheel-cutting (as required), in one engine or machine.

In Plate XVI., fig. 1, is an end elevation of the machine, exhibiting the general arrangement of the tool for turning, boring, sliding, screw-cutting, and wheel-cutting; fig. 2, is a side elevation of the machine; and fig. 3, is a plan or horizontal view of the same, as seen from above. A, is the head for wheel-cutting; B, the spindle or turning head-stock; C, the lathe-bed, with its carriage and loose head-stock; D, the driving connection between the spindle and regulator-screw; E, the connection between the handle-shaft and the regulator-wheel F, for dividing, when cutting the teeth of wheels; and G, is the cutter for metal, which may be driven in any convenient manner. Figs. 7, and 8, are two detached views of the spindle and cutter for cutting wood wheel patterns or cogs, and when used, they are to be put in the place of the cutter and spindle G.

Figs. 4, 5, and 6, represent, in three different views, a particular arrangement of mechanism for moving the tool-carriage by means of a screw, when used for screw-cutting and sliding, and turning transverse surfaces; the screw being used, in the latter cases, simply in the character of a shaft, and in such a way that the threads of the screw are preserved in perfect condition, to be used exclusively for screw-cutting: fig. 4, is a longitudinal section; fig. 5, a transverse section; and fig. 6, a plan view of the arrangement. *a*, is the regulator-screw, with a groove *b*, extending the whole length of its thread; *c*, is a worm, with its key fitting and sliding in the groove *b*; the worm over-riding the threads of the screw, and working in the wheel *d*, which drives the mitre-wheels *e*, *e*; they again through the shaft *f*, driving the spur-wheels *g*, *g*, and the pinion *h*, which, working in the rack *i*, moves the carriage for "sliding." When employed for "surfacing," the worm *c*, gives motion (as just described) to the mitre-wheels *e*, *e*; but the shaft *f*, is pushed endwise, and while the spur-pinion *g*, is thus put out of gear, the spur-wheel *j*, is brought into gear with the pinion *k*: this pinion is on the end of the screw *l*, which moves the slide for transverse surfacing. When used for "screw-cutting," the spur-wheel *j*, and the mitre-wheel *e*, are moved out of gear, and the clasp-nut *n*, closed; the spur-pinion *g*, remains in gear, so as to be ready for use in running back the carriage, by means of a handle on the end of the shaft *f*, which acts upon the rack through the medium of the wheels *g*, *g*, *h*. The worm *c*, rests upon the lugs *m*, *m*, and thereby forms a support or bearing to the screw, without coming in contact with, or in any way injuring its threads; and at the same time keeps the screw always parallel with the line of centres, and central with the clasp-nut *n*, *n*.

The patentee claims, as his invention, the novel and particular arrangement, combination, or construction of mechanism or apparatus, designed for the purposes of turning, boring, sliding, screw-cutting, and wheel-cutting, in one engine, machine, or tool, as exhibited in figs. 1, 2, and 3, in the drawing; and particularly the detailed arrangement shewn in figs. 4, 5, and 6, of the worm *c*, over-riding the regulator-screw *a*, in the manner and for the purpose above described, whether in connection with the wheel-cutting apparatus, or otherwise.—[*Inrolled in the Petty Bag Office, April,* 1845.]

Specification drawn by Messrs. Newton and Son.

To James Harrison, *of Irwell House, in the parish of Bury, in the county of Lancaster, manufacturer, for certain improvements in machinery or apparatus for spinning cotton and other fibrous substances.*—[Sealed 15th July, 1844.]

This invention applies to that class of spinning machinery called "mules," "billies," "stretchers," and "jennies," and particulary those called "self-actors;" and consists, firstly,—in the novel application of a revolving clearing-shaft or roller to the front of the roller-beam of such machines, to collect any waste flyings or loose filaments of cotton, or other fibrous substance that may fall from the drawing rollers, during the process of spinning; and also to remove or take up all waste that may accumulate on the top of the mule-carriage, as it passes under the roller-beam when "putting up." This shaft is caused to revolve by means of a band passing around a grooved pulley on its end (or otherwise), and as it revolves in the same direction as the mule-carriage passes under it, while "going in," but rather faster than the carriage, it is evident that it will collect or lick up the loose waste, whichever way the carriage may be passing under it.

The invention consists, secondly, in causing the clearing-shaft to travel up the front of the roller-beam, during the "going out" of the carriage, and just at the close of the stretch, so as to clear the front of the roller-beam, and also the front of the stands which carry the drawing-rollers. This is effected by placing bushes or collars at intervals along the whole length of the machine, around the clearing-roller, in which it can revolve loosely; to these bushes chains or bands are fastened, which pass over the roller-beam to pulleys, placed at corresponding intervals upon a shaft, behind the drawing-rollers; these pulleys have counterbalance weights attached to the side farthest from the roller-beam, which, by the chains being attached to them, will assist in raising the clearer-shaft. The chain from one of the bushes, instead of being fastened to the pulley, passes around it, and thence over carrier-pulleys to a rod sliding in bearings, fixed to the railway upon which the mule-carriage traverses; this rod has a pin or stud extending from it in a horizontal direction, against which an arm, fixed to the carriage, strikes, at or near the close of each stretch, and, by carrying the rod with it, will cause the chain to lift the clearer-shaft (which is continually revolving), and carry it up the front of the roller-beam, thereby collecting all the waste upon its surface. As soon as the mule-carriage commences its "going in," the clearer-shaft will fall slowly into its original position, and clear or sweep the top-board of the carriage, as it passes under the roller-beam.

When these improvements are applied to a mule or similar machine, the top-board of the carriage should be made level, instead of being placed at an angle with the horizon, as usual; but if it is desired to apply this invention to mules, without altering the top-board of the carriage, the clearer-shaft may be mounted in the ends of a series of levers, having their fulcra below the roller-beam, and being weighted at their other ends; which levers, by vibrating upon their fulcra, will allow the clearer-shaft to adapt itself to the inclination of the carriage top, as it passes under the roller-beam. A stop or guide must be placed below the clearer-shaft, to prevent it from falling below the level of the lowest point of inclination of the top-board of the carriage.

In Plate XVII., fig. 1, is an end elevation of the framing of a self-actor mule, with these improvements applied thereto; and fig. 2, is a partial front view of the same. *a, a,* is the end framing of the mule; *b, b,* the carriage; *c, c,* the head-stock driving-pulleys; *d,* the roller-beam; and *e, e,* the drawing-rollers. *f,* is the clearer-shaft, which revolves in bearings *g, g,* placed at suitable intervals along the whole length of the roller-beam, and serving also as guides for steadying the clearer-shaft *f,* as it rises into the position represented at fig. 3, for the purpose of clearing the roller-beam. At one end of the shaft *f*, is a pulley *h*, around which a driving-band *i*, passes, causing the pulley and shaft to revolve in the direction of the arrow, so that as the carriage *b*, *b*, passes under the roller-beam *d*, the shaft *f*, will clear or lick up all the loose waste or flyings from the top-board *k*, of the carriage. *l*, *l*, are bushes or collars, in which the shaft *f*, revolves freely. To these bushes are fastened chains *m*, *m*, which pass over small carrier-pulleys *n*, *n*, upon the roller-beam *d*, to the pulleys *o*, *o*, keyed upon the shaft *p*. These pulleys are weighted on the side farthest from the roller-beam, so as to counterbalance (or nearly so) the weight of the shaft *f*. In order to cause the clearer-shaft *f*, to travel up the front of the roller-beam *d*, the chain from one of the bushes, instead of being attached to its corresponding weighted pulley, passes around it, and thence over and under the carrier-pulleys *q*, and *r*, to the rod *s*, below, to which it is made fast. This rod *s*, slides in bearings *t*, *t*, fixed to the railway of the mule, and motion is communicated to it at every "going out" of the carriage, in the following manner:—To the back of the carriage *b*, *b*, is fixed an arm *u*, which strikes against a stud *v*, on the rod *s*, every time the carriage runs out, and thereby carries the rod *s*, with it; which rod being connected to the shaft *f*, by the chain *m*, will cause that shaft to travel up the front of the roller-beam *d*, until the carriage *b*, *b*, has arrived at its greatest distance from the roller-beam. As soon as the carriage begins to return, it releases the stud *v*, from the arm *u*, and allows the clearer-shaft to fall, by its own gravity, into its original position, in time to clean the top of the carriage *b*, *b*, as the carriage passes under the roller-beam *d*.

Fig. 3, is a section of the roller-beam, shewing more distinctly the peculiar application of a travelling clearer-shaft thereto, to operate both upon the roller-beam and the carriage-top; and fig. 4, is a similar view, shewing the application of a stationary clearer-shaft for cleaning the top of the carriage only: the dotted line, in both instances, representing the level of the top of the carriage.

The patentee claims, as his invention, the novel and particular application of a revolving clearer-shaft to the roller-beam of "mules," "billies," "stretchers," and "jennies," employed for spinning cotton and other fibrous substances, in the manner and for the purpose above described.—[*Inrolled in the Petty Bag Office, January,* 1845.]

Specification drawn by Messrs. Newton and Son.

To Alexander Parkes, *of Birmingham, in the county of Warwick, artist, for improvements in the manufacture of certain alloys or combinations of metals, and in depositing certain metals.*—[Sealed 29th October, 1844.]

The improvements in the manufacture of alloys or combinations of metals consist in the combination of various metals to produce five different kinds of white or pale-colored alloys.

The first kind of alloy is composed of zinc, tin, iron, and copper, in the proportions described below. The patentee says, he is aware that the same metals have been before proposed to be used, but in different proportions, and producing a red or reddish yellow alloy, not malleable; whereas, in the present case, a white or pale-colored alloy, possessing considerable malleability, is obtained. 100 lbs. of the new alloy are produced by the employment of the above metals, in the following proportions:—33½ lbs. "foreign zinc," 64 lbs. tin, 1¼ lbs. iron, and 2¼ lbs. copper; or, 50 lbs. zinc, 48 lbs. tin, 1 lb. iron, and 3 lbs. copper; or any intermediate proportions of zinc and copper may be used. The iron and copper are first melted together in a crucible, placed in a casting furnace; while these metals are in a fused state, the tin is introduced, in such quantities at a time that the iron and copper shall not become solid; the zinc is then added, and the whole thoroughly combined by stirring. The flux recommended for this alloy is composed of 1 part lime, 1 part Cumberland ore, and 3 parts sal-ammoniac (by weight). This alloy may be cast in sand, or into ingots for rolling, as required.

The patentee claims the use of zinc, tin, iron, and copper, combined in the proportions above mentioned.

The second kind of alloy is formed of zinc, tin, and antimony (either with or without the addition of arsenic), in the proportions of 66 lbs. foreign zinc, 32¼ lbs. tin, and 3¼ lbs. antimony; or, 79¾ lbs. zinc, 19½ lbs. tin, and 2¾ lbs. antimony; or any intermediate proportions. These ingredients are melted in an iron or clay vessel (the flux used being that known as the "black flux"), and, when thoroughly combined, the alloy is cast in sand, or into ingots. If this alloy is to be made into sheets, it is rolled cold; and when employed for sheathing ships, an addition is made of from 8 oz. to 16 oz. of metal arsenic to each 100 lbs. of the alloy.

Under this improvement, the feature of novelty claimed is, the use of zinc, tin, and antimony, with or without arsenic, in the proportions above mentioned.

The third improvement in the manufacture of alloys consists in the combination of zinc, copper, iron, and nickel, in such proportions as to produce a white metal, which may be used as a substitute for German silver. The iron and nickel are first combined in certain proportions (they are preferred to be in equal quantities, but 1 part nickel to 2 parts iron will also answer); the copper is then added, and afterwards the zinc,—or the copper and zinc may be combined together previously to being added. The requisite quantities of the different metals for making 100 lbs. of the alloy, are:—45½ lbs. alloy of iron and nickel in equal proportions, 45½ lbs. copper, and 10½ lbs. foreign zinc; or 30¾ lbs. alloy of iron and nickel in equal proportions, 46 lbs. copper, and 26¼ lbs. zinc; or any intermediate proportions of zinc and copper.

The patentee claims the means of making a white alloy by combining nickel, iron, copper, and zinc, in the range of proportions above mentioned.

The fourth description of alloy consists of nickel, silver, and copper, either alone or in combination with zinc or other metals. The proportions of the different metals will depend upon the purposes to which the alloy is to be applied; but the two following are useful compounds, and little oxidized by the atmosphere:—60 lbs. copper, 20 lbs. nickel, and 20 lbs. silver; or 60 lbs. copper, 10 lbs. nickel, 10 lbs. silver, and 20 lbs. zinc. The copper and nickel are first melted together, with or without flux; and then the other metals are added, either together or separately.

The patentee claims the producing an alloy of silver, nickel, and copper, with or without zinc.

The fifth kind of alloy is composed of nickel, iron, and copper, in the proportions of 25 lbs. nickel, 25 lbs. iron, and 50 lbs. copper; or 15 lbs. nickel, 25 lbs. iron, and 60 lbs. copper. The iron and nickel are first melted together, with either of the fluxes before mentioned, and then the copper is added. This alloy is stated to be a non-conductor of heat.

The claim made under this improvement is for the production of an alloy of nickel, copper, and iron, in the range of proportions above mentioned.

The last part of this invention relates to the deposition of metals from their salts by means of electric currents, and consists in employing the salts or compound salts of the metals in a liquid state, produced by the application of heat, in place of dissolving the salts in water, as usual. The salts which the patentee has found most advantageous for the above purpose, are the iodides, chlorides, and phosphates, but others may be used, and generally those capable of holding the metals when in a fused state. These salts may also be employed in combination with other salts (care being taken not to use those salts which will decompose them); as for example, the iodide of gold or silver may be used alone, or combined with the iodide of potassium or sodium, or with the hyposulphites and some others.

The methods of employing salts of silver according to this part of the invention are as follow:—6 lbs. chloride of silver are fused in a suitable vessel, by preference of silver or enamelled iron; a plate of silver is then suspended therein, and connected with the negative pole of an electrical apparatus; and the article to be silvered being also immersed in the liquefied salt, and connected with the positive pole of the electrical apparatus, will soon become coated with silver. Or 6 lbs. iodide of silver are fused, as above; and if it be desired to add other salts thereto, in order to obtain a larger quantity in a fused state for a bath, the iodide of potassium is preferred to be used, in the proportion of from 3 lbs. to 10 lbs. thereof, to 6 lbs. iodide of silver; sometimes other metallic salts are employed, as for example, the iodide of mercury or copper, in the proportion of from 1 lb. to 2 lbs. of either, to 6 lbs. iodide of silver.

When gold is to be used instead of silver, the patentee fuses 20 oz. iodide of gold; and as this salt is costly, he prefers to use with it a larger proportion of iodide of potassium or sodium, say 80 oz.; the remainder of the process is the same as that above described for silver, except that a plate of gold is substituted for the plate of silver.

The salts of platinum, copper, and zinc, are treated in the same way as the salts of gold and silver.

The patentee does not confine himself to the use of the particular salts or processes above described; his claim, under this part of his invention, being for the deposition of metals by electric currents from their salts, when in a state of fusion, and whether used separately, or combined with other salts.—[*Inrolled in the Inrolment Office, April,* 1845.]

To GEORGE FERGUSSON WILSON, *of Belmont, Vauxhall, in the county of Surrey, Gent.;* GEORGE GWYNNE, *of Princes-street, Cavendish-square, in the county of Middlesex, Gent.; and* JAMES PILLANS WILSON, *of Belmont, aforesaid, Gent., for improvements in treating fatty and oily matters, and in the manufacture of candles.*—[Sealed 31st October, 1844.]

THE first part of this invention consists in the following mode of manufacturing fatty acids, whereby the process of saponification, by which they are ordinarily obtained, is dispensed with; and also the use of copper vessels, placed over an open fire; together with inconvenient mechanical stirring: A large quantity of tallow, or other fatty or oily matter (about five tons, the patentees preferring a large quantity, because the heat is more perfectly maintained), is boiled in an iron vessel, provided with a worm at the bottom, through which steam is passed, having been previously heated to about 600° or 700° Fahr., by being conveyed, in iron pipes, through a fire; and the steam is passed through the fatty or oily matter until the latter is thereby heated to about 350° Fahr.; the steam and the offensive vapour that is produced being carried into a high shaft, by a pipe from the cover of the iron vessel. The fatty or oily matter, having been heated by this or other suitable means, is allowed to run into another vessel, made of brick, lined with lead, and sunk in the ground, for the purpose of supporting the brick-work under the internal pressure of the fluid; it has a wooden cover, lined with lead; directly beneath which, and extending across the vessel, is a leaden pipe, one inch in diameter, having a small hole on each side, at every six inches of its length; and through this pipe is introduced a mixture of 1000 lbs. of sulphuric acid, sp. gr. 1·8, and the same weight of water. The introduction of the mixture, which falls in divided jets into the heated fat, produces violent ebullition; and, by this means, the acid and fat are perfectly incorporated, before the action of the acid becomes apparent by any considerable discoloration of the fat. As the ebullition ceases, the fat gradually blackens; and the matter is allowed to remain for six hours after the violent ebullition has ceased;—the offensive fumes and vapour produced in this operation are carried off by a large pipe, which rises from the top of the vessel, then descends, and afterwards rises again into a high chimney; at the downward part of this pipe a small jet of water is kept playing, to condense such parts of the vapours as are condensible; and from the extreme lowest point of the bend the water escapes through a small pipe into a drain. At the end of the six hours, above mentioned, the operation is complete, and the product is then pumped into another close vessel, and washed, by being boiled up (by means of free steam) with half its bulk of water;—the steam being rendered offensive by this process, is treated in the same way as the vapours escaping from the former vessel. The water is then drawn off, and the washing repeated in like manner, except that in the second washing the water is acidulated with 100 lbs. of sulphuric acid. The ultimate product is allowed to settle for twenty-four hours; after which, it is distilled in an atmosphere of steam, once or oftener, until well purified; and the product of distillation is again washed, and, after being pressed, is applied to the manufacture of candles.

The second part of this invention relates to the manufacture of composite candles, which are composed of fatty acid, mixed with stearine of cocoa-nut oil, or other unacidified fatty material. The fatty acid is usually obtained by what is termed the process of saponification; but the patentees propose to substitute fatty acids obtained without saponification, by means of the first part of this invention, or by other suitable process of direct acidification. The composite candles are preferred to be made with two parts of fatty acid of tallow or palm oil, pressed and distilled, and one part of stearine of cocoa-nut oil; or, for a very cheap composite candle, two parts of unpressed fatty acid of tallow or palm oil are mixed with one part of crude cocoa-nut oil, and to this mixture three per cent. of wax is added, to amalgamate the materials, and prevent oiliness.

The patentees state, that, in the course of their researches into the acidification of fat, they have found that a species of direct acidification is effected by the oxygen of the air. Long exposure to the air, especially in a melted state, in shallow vessels, produces some effect of this kind; but the effect is greatly accelerated by passing the air in streams through the fatty or oily matter in a liquid state, in the manner described in the specification of a patent granted to Arthur Dunn, March 28, 1843*; or by other suitable means. This action of the air on fatty or oily matters is not claimed by the patentees; but finding that the acidified products of such action may be advantageously distilled, they effect such distillation in the following manner:—Any convenient quantity of fatty or oily matter (say 15 cwt. of palm oil), after being subjected to the action of the air, is distilled in an atmosphere of steam, by the apparatus, and in the manner described in the specification of a patent obtained by George Gwynne, and George Fergusson Wilson, November 16, 1843; or by other suitable means. The process of distillation is continued as long as the distilled matter comes over freely, and without much offensive odour; and afterwards the undistilled residuum is treated in the manner described in the same specification;

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* For description of this invention, see Vol. XXIV, p. 100, Conjoined Series.

or, in preference to the process of saponification therein recommended, the process of direct acidification with acid, hereinbefore described, may be substituted: the several products are applied to the manufacture of candles in the ordinary manner.

The claims made by the patentees are as follow:—"First,—we claim the mode of producing the direct acidification of fatty and oily matters, by applying the acidifying agent thereto, when the fatty or oily matter is at a high temperature, exceeding 120° Fahr.;—and we also claim the previous heating of the same to the requisite temperature in a separate vessel or vessels to that in which the acidifying matters are afterwards applied; by which means, other than copper or earthenware vessels may be employed. Secondly,—we claim the using of heated steam in the processes for acidifying fatty and oily matters. Thirdly,—we claim the use of diluted acid for producing the direct acidification of fatty and oily matters. And we claim the dispensing with mechanical stirring in the process of direct acidification. Fourthly,—we claim the application to the manufacture of composite candles of fatty acids obtained without saponification. Fifthly,—we claim the distillation of fatty and oily matters subjected to the action of the air, as above described;—and we claim the application of the products of such distillation to the manufacture of candles."—[*Inrolled in the Rolls Chapel Office, April,* 1845.]

To JOHN SPENCER, *agent of the Phœnix Iron Works, West Bromwich, in the county of Stafford, for improvements in manufacturing or preparing plates of iron or other metal, for roofing, and other purposes to which the same may be applicable.*—[Sealed 23rd November, 1844.]

THIS invention consists in a novel mode of manufacturing or preparing sheets or plates of metal with corrugated or grooved surfaces, and of giving to such sheets or plates of metal the required forms with greater facility and at less cost than by the processes at present in use.

The methods hitherto employed for producing grooved or corrugated plates of iron or other metal, have been either by stamping between dies, when sheets or plates of metal are used, or by casting in a mould. The improved plan consists in passing the sheets or plates of metal, in either a warm or cold state, between fluted rollers mounted in strong standards, as seen in Plate XVIII., where fig. 1, represents a front elevation of the rollers; and fig. 2, a transverse vertical section of the same, shewing the sheet of metal passing between the rollers in the direction of the arrow, and being delivered at the opposite side with corrugated surfaces, corresponding to the flutes or longitudinal grooves of the rollers. The corrugated or grooved plates thus produced, may be employed either for constructing roofs or other parts of buildings, or for the various purposes to which such plates are, or may be, considered applicable.

When it is desired to give an arched or curved form to corrugated plates, the apparatus shewn at fig. 3, is employed. In this figure *a, a,* are two plain rollers, capable of adjustment in the framing *b, b*; and *c,* is a grooved roller—also capable of adjustment, placed above the plain rollers *a, a.* The grooves in this roller *c,* should correspond with the corrugations in the plate, to form a guide to the plates as they are passed between the rollers. By this means the plates are bent into a curved or arched form; which curve or arch may be varied according to the relative positions of the rollers, or the diameter of the grooved roller.

The patentee claims, First,—the improvement in the manufacturing or preparing corrugated sheets or plates of metal, by passing them between grooved or fluted rollers, as above described, with reference to figs. 1, and 2; and, Secondly,—the improvement in the manufacturing or preparing such plates, by bending them into the required forms, by the pressure of plain rollers, acting in conjunction with a grooved roller, as shewn at fig. 3, of the drawing.—[*Inrolled in the Petty Bag Office, May,* 1845.]

Specification drawn by Messrs. Newton and Son.

To **Josias Christopher Gamble,** *of St. Helen's, in the county of Lancaster, manufacturing chemist, for his invention of improvements in the manufacture of sulphuric acid.* —[Sealed 4th December, 1844.]

These improvements in the manufacture of sulphuric acid, consist in the abstraction of the heat produced by the combustion of the metallic sulphurets employed in such manufacture, and applying it to the evaporation of acid and saline solutions. The bisulphurets of iron and copper are the metallic sulphurets employed in this manufacture; and the high heat produced by their combustion is highly injurious to the leaden chambers; rendering the sulphuric acid, produced, less pure, whilst, at the same time, it retards its formation. The method of extracting the heat and applying it to the purpose of evaporation, will be seen by reference to Plate XVII., in which fig. 1, represents, in longitudinal elevation, the furnace employed; fig. 2, is a vertical section, shewing the kilns and their connection with the chimney shaft; and fig. 3, is a horizontal section taken in the line 1, 2, of fig. 1, shewing the construction of the nitric acid flue. A, A, are four kilns for burning pyrites; B, is the flue in which nitric acid gas is produced; and C, the flue to conduct it to the chimney D. The nitre pots are put in at one end of the flue B, and are withdrawn at the other; the apertures are all closed with doors, when not in use, exeepting those used for discharging the pyrites. Above the flue C, and opening into the chimney, are three flues E, (see the dotted lines fig. 3,) which conduct the sulphurous acid gas away from the kilns A.

By this arrangement, the nitric acid gas, and sulphurous acid gas, are kept separate until they enter the chimney, from whence they proceed to the leaden chamber F. The kilns are usually inverted quadrangular truncated pyramids, fifteen inches in diameter at bottom, three feet wide at top, and eight feet deep. They are constructed in the usual way, with doors for charging and stirring the materials, and have an opening for drawing or discharging the materials; G, is an arched vault, to allow of a passage or opening being made for the discharge of the kilns next it; one of which openings is shewn at H; the other kilns are discharged at the openings I, I. Over the kilns an arch is turned ten feet in length; the groins of the arch are filled up to a level with the crown, so as to form a level bed for supporting the leaden evaporating pan K. L, and M, are two other leaden evaporating pans, placed over the flue E, and supported in their place by bars of iron, resting upon the walls of the furnace. These pans are preferred to be employed in concentrating sulphuric acid; they are each ten feet long, by six feet wide. Weak acid is introduced into the pan M, next the chamber F, at about 1·520 specific gravity, and brought forward by degrees to the pan K, where it is concentrated to 1·750. The pan M, is raised two inches above the pan L, and that two inches above K. These pans are fully equal to concentrate the sulphuric acid produced by the above kilns, and their corresponding capacity of chambers.

If it should be thought advisable to concentrate soda, or common salt solutions, a single pan of iron might be substituted for the leaden pans above described.

The flues conveying the sulphurous acid gas being liable to get stopped up from time to time, by the sublimation of volatile metallic oxides, it will be advantageous to have holes at the ends of these flues, near the chimney, for the purpose of cleaning them occasionally.

The patentee claims the application of the heat produced by the combustion of bisulphurets of iron and copper, in making sulphuric acid, for the purpose of concentrating the said sulphuric acid and other saline solutions.—[*Inrolled in the Petty Bag Office, June,* 1845.]

Specification drawn by Messrs. Newton and Son.

To THOMAS METCALFE, *of Eaton-square, Pimlico, in the county of Middlesex, brush-maker, for improvements in the manufacture of brooms, brushes, or other similar articles.*—[Sealed 7th December, 1844.]

THIS invention consists, firstly, in a peculiar application to hair brooms and brushes of certain vegetable and animal substances, which possess an elastic character (but are less elastic than the hair or bristles), whereby a stiff sweeping surface is obtained, capable of removing dirt and other substances requiring removal, while, at the same time, the bristles will take up or drive forward the smaller particles, which the more stiff vegetable and animal substances may leave behind. The substances proposed to be employed for this purpose are those commonly known in the trade under the names of bast or bass, whisk, cane, kiava, cocoa-nut fibre, and whalebone; but any substance, having the same property of elasticity, may be used.

By referring to Plate XVIII., the mode of applying the invention to the various descriptions of brooms and brushes will be clearly seen. Figs. 1, 2, and 3, represent side, end, and plan views of a broom for sweeping floors, &c.; the bast, whalebone, or other stiff substance, is placed in the front part of the broom, as shewn at *a, a,* and the hair or bristles *b, b,* form the back half of the broom. Fig. 4, represents the improvement applied to what is termed a banister brush; and figs. 5, shew it applied to a clothes brush.

It should be remarked, that, in all cases, the bast, whisk, cane, or other similar substance, will be placed on that side of the broom or brush which, according to the ordinary mode of using it, first comes in contact with the dust or dirt to be removed.

The second part of the invention consists in a combination of broom and scraper, which the patentee calls a street broom. Fig. 6, represents a front view of this implement; and fig. 7, an end view of the same. *a, a,* is an iron plate or scraper, placed in front of the bast *b,* and attached to the wooden back *c, c,* by means of screw-bolts, which pass through the plate, and secure it to the slotted brackets *d, d,* attached to the wooden back, as shewn in the drawing. The plate *a, a,* is made capable of adjustment, in order that, as the brush is worn away, the edge of the scraper may be brought to a level with it; this is effected by unscrewing the nuts *e, e,* and passing the bolts further up the slots of the brackets *d,* by which means the edge of the scraper may be elevated as required; or, instead of rendering the scraper adjustable, it may be fixed, and the scraping edge cut away with shears, to make it even with the broom.

The third part of the invention consists in cutting and arranging the hair or bristles of a tooth-brush, so that one part of the hair or bristles may enter the hollows or spaces between the teeth, while the other portions of the hair are clearing the surface of the teeth; thus making one brush serve the purposes for which two are usually employed. Figs. 8, represent, in side and end views, the improved tooth-brush; *a*, is the middle of the brush, composed of bristles or stiff hair, and cut to a sharp angle; the sides *b*, *b*, are made of softer hair or fine bristles, and cut level and shorter than the middle portion. By the employment of this brush, the advantage of stiff bristles is obtained; while, at the same time, the soft hair or bristles, which (forming the sides of the brush) come against the gums, will clean the teeth to their roots, without tearing or injuring the gums.

The patentee claims, under the first head of his invention, the peculiar method, above described, and shewn in the drawing, of combining hair or bristles with the before-mentioned animal and vegetable substances, whereby the separate advantages of a coarse and fine broom or brush are combined in the same instrument. Secondly,—the combination of a broom and scraper, to be used by hand in cleaning streets and other places, as above described. And, Lastly,—the peculiar cut of hair or bristles, and the arrangement of the same, for the formation of a tooth-brush, described with reference to figs. 8, of the drawing.—[*Inrolled in the Petty Bag Office, June,* 1845.]

Specification drawn by Messrs. Newton and Son.

To GEORGE MILLICHAP, *of Birmingham, in the county of Warwick, for improvements in the construction of axletrees.*—[Sealed 25th November, 1844.]

THIS invention consists, firstly, in forming screws upon the arms of axletrees, in such a manner, that in the event of the ordinary securities failing, the wheels cannot come off, so long as the carriage is moving onwards (the screws being so arranged with respect to corresponding ones in the axle-boxes, that the wheels can only be removed by turning them back); and, secondly,—in an improved form of collet, to be applied to the arms of axletrees.

In Plate XVIII., fig. 1, is a longitudinal section of part of an axle and its box, manufactured according to this invention; fig. 2, is an external view of the axle-arm; and fig. 3, is a longitudinal section thereof, taken at right angles to the section, fig. 1, and shewing the passage through which oil is introduced into the axle-box. The axle is, for the most part, of the ordinary construction (but although the patentee prefers to apply his invention to this description of axle, he does not confine himself thereto), and the means of retaining the axle-box on the axle are such as have been heretofore resorted to. On the arm *a*, of the axle, a screw *b*, is formed, which is received into a cavity *c*, in the axle-box *d*, and will retain the latter upon the axle, if the ordinary fastenings have given way, so long as the carriage continues to move onwards; but if the wheel be turned back, the axle-box will become unscrewed from the axle.

The improved collet *e*, is shewn separately, in section and plan view, at figs. 3. In the interior of the collet two ridges or projections *f*, *f*, are formed; and in place of the screw at the end of the axle being made flat on one side, to correspond with the flat portion of the interior of the collet, as heretofore made, it has a groove *g*, on each side, so that the collet can pass over the screw, and the projections *f*, *f*, be allowed to enter the grooves *h*, *h*, of the bearing of the collet on the axle.

The patentee claims the making of axletrees with screws thereon, in such manner that, the other means of security failing, the screws retain the wheels on the axletrees, so long as the wheels are moving onward, as above described. He also claims the mode of constructing a collet, and the end of an axletree for receiving it, as above described.—[*Inrolled in the Inrolment Office, May,* 1845.]

To Benjamin Baillie, *of Henry-street, in the county of Middlesex, glazier, &c., for improvements in regulating the ventilation of buildings.*—[Sealed 25th November, 1844.]

These improvements consist in arranging narrow plates of glass as fixed louvres, in suitable frames to be introduced into window-sashes, and combining therewith sliding or other opening or closing plates of glass, in such a manner, that when desired, the openings between the fixed glass louvres may be wholly or partly closed, so as to prevent, or partially prevent, the passage of air, and yet allow of light passing through the apparatus.

In Plate XVIII., is shewn a vertical section of a sash window, with the ventilator fixed in the position which has proved to be the best for avoiding drafts, that is, at the centre pane of the second row from the top of the window. *a, a,* are the fixed inclined glass louvres; and *b,* is the glass slide for regulating the quantity of air admitted. The slide *b,* is suspended from two cords *c,* which pass over a series of pulleys *d, d,* and are connected to an endless cord *e,* that passes over a rack-pulley *f,* in the same manner as the cord of an ordinary roller blind: if the top sash is required to be frequently pulled down, a counterbalance weight is attached to the cord *e,* instead of passing it over a rack-pulley. *g,* is an eye, which is screwed into the sash bead, and through it the cord *e,* runs; *h, i,* are connecting sockets, which serve both to unite the cords, and also (by coming in contact with the eye *g,*) to stop the slide *b,* from being drawn up too far, or let down too violently.

If the ventilator is fixed in one of the top panes, the slide is lowered to admit the air, instead of being raised for that purpose. When the ventilator is applied to basement, attic, or other windows, where the top panes can be easily reached by the hand, the glass slide is furnished with a handle, by which it is moved in a horizontal direction, for the purpose of admitting or excluding the air.

The patentee claims the mode, herein described, of combining glass into an apparatus for the purposes of ventilation, whereby narrow plates of glass are fixed as louvres in frames, and combined with a moveable plate as a valve or cover.—[*Inrolled in the Inrolment Office, May,* 1845.]

To John Barker Anderson, *of Great Suffolk-street, Surrey, for improvements in the manufacture of soap.*—[Sealed 25th November, 1844.]

This invention consists in subjecting curd soap, after it has been boiled to "strength," to a "fitting" process, somewhat similar to the ordinary fitting process in the manufacture of yellow soap, and thereby separating from it a substance resembling the "niger" or "nigre" of yellow soap; when this niger has been removed, the remainder of the "goods" is boiled into curd soap; and, by this means, a curd soap is obtained, of better quality than the original charge of goods would have yielded without this operation. The niger, thus separated, is used for making mottled soap.

The ordinary materials for making curd soap are boiled with the leys, in the usual manner, until the goods are brought to strength, and "ribbon out" well on the finger; at this stage, instead of boiling out the "head," and finishing as heretofore practised, the strong ley is pumped out of the copper, and the goods are treated with successive portions of weak ley, or water, and boiled until they assume the appearance of the goods of a "fitting yellow copper;" the operation of boiling is then stopped, and the niger allowed to settle, which will require from 24 to 36 hours; after this, the niger is pumped from under the purified goods into another copper, or the goods are removed from above the niger into another copper; and then the proper finishing ley for curd soap is added to the goods, and they are boiled to a suitable curd, or until the soap is fit for cleansing off into the frames.

When a charge of very impure materials is operated upon, or when, from other circumstances, it may be considered advantageous, the fitting process is repeated one or more times; in which case, after the niger has been separated from the goods, an addition is made to the residual partially purified goods, of a ley of moderate strength only, instead of the finishing ley for curd soap, and they are boiled therewith (care being taken that no head is formed); this ley is then pumped out, and the goods again treated with weak ley, or water, until sufficiently diluted, so as to perform the fitting process; after which, the niger is allowed to settle, and is separated from the goods; then the finishing ley is added, and the goods boiled to a curd, as before described.

The niger (which has been separated from the goods, as above mentioned) is treated with the ordinary ley used for finishing a mottled soap, and boiled until the soap is fit for cleansing off into the frames. The patentee occasionally adds to the niger, tallow, bone fat, melted stuff, or other suitable material, and afterwards proceeds as with an ordinary charge for mottled soap.

The patentee claims, Firstly,—the manufacture of a curd soap, by separating from the materials originally put into the copper, the niger or nigre substance above alluded to, and boiling the remainder of the materials into curd soap; by which means, a purer and better soap is produced, than the said materials would yield without this treatment. Secondly,—the making of this niger or nigre substance into a mottled soap, with or without the addition of other materials, as above described.—[*Inrolled in the Inrolment Office, May,* 1845.]

To NARCISE LEROY, *of Paris, in the kingdom of France, merchant, for improvements in covering the tops of bottles, jars, and other vessels,—being a communication.*—[Sealed 28th November, 1844.]

THIS invention relates to the application of metal caps or covers to the mouths of bottles, jars, and other vessels; and consists in making indentations in the metal caps, so as to produce several projections on the interior of the same; which, when the cap is placed over the mouth of a bottle, jar, or other vessel, enter into a male screw, formed upon the neck of the vessel (the projections representing portions of a corresponding female screw); and the cap, being then turned round, becomes firmly screwed on to the neck of the vessel.

In Plate XVIII., fig. 1, is a vertical section of the neck of a bottle, having a metal cap applied thereto; and fig. 2, is a plan view of the cap, turned bottom upwards. *a*, is the neck of the bottle; *b*, the cork, which is kept in its proper place by the cap *c*; and *d*, *d*, are the indentations or projections that enter the male screw. Fig. 3, shews a metal cap applied to a bottle containing aerated liquor; and fig. 4, is a plan view of the cap, turned bottom upwards. There is a hole in the top of the cap, through which the end e^1, of the instrument *e*, (figs. 3, and 5,) is introduced, in order to retain the cork or stopper in the bottle while the cover is being removed; the end e^1, bears upon the cork, and the part e^2, is pressed against the neck of the bottle, so as to partly embrace it; the cap is then to be unscrewed, and taken off the neck of the bottle, by being passed along the instrument *e*. The cork will now be kept securely in its place until the instrument is withdrawn. Fig. 6, is a vertical section of the neck of a jar, shewing the improved mode of securing a metal cap thereon; and fig. 7, is a plan view of the cap, turned bottom upwards.

The patentee claims the making metal caps or covers for bottles, jars, and other vessels, with indents *d*, *d*, to take into screws, as above described.—[*Inrolled in the Inrolment Office, May,* 1845.]

To HENRY CHARLES LACY, *of Kenyon House, near Manchester, in the county of Lancaster, Esq., and* GEORGE WATSON BUCK, *of Manchester, in the said county of Lancaster, civil engineer, for a new manufacture for, and method of sustaining the rails of railways.*—[Sealed 14th January, 1845.]

THIS invention consists in the application of plate or sheet malleable or wrought iron to the purpose of sustaining the rails of railways, either as whole length cross sleepers, in lieu of the present wooden sleepers, or as short or half sleepers, instead of the stone blocks now used.

The mode of employing the malleable or wrought iron sleepers, whether as whole length cross sleepers, or as short or half sleepers, is represented in Plate XVII., fig. 1, being a side elevation of one of the whole length cross sleepers, with the chairs, rails, &c. secured thereon; fig. 2, a plan view; and fig. 3, a transverse section of the same. *a*, is the sleeper; *b*, *b*, are blocks of wood, placed upon the sleeper for sustaining the chairs *c*, *c*, that carry the rails *d*, *d*. The blocks *b*, *b*, and chairs *c*, *c*, are fastened to the sleeper by bolts *e*, *e*, in the lower ends of which, cotters *f*, *f*, are inserted, and on their upper ends nuts *g*, *g*, are screwed, and by this means the whole is bound firmly together;—the bolts *e*, *e*, are prevented from being turned by the act of screwing on the nuts, by their lower ends being flattened, and entering corresponding holes in the sleeper. *h*, *h*, are iron clips or ties, placed across the under side of the sleeper, and turned over the edge of the same, for the purpose of stiffening it.

Fig. 4, is a section (taken transversely across the railway,) of a short or half sleeper of a tray-like form; fig. 5, is a plan view of the same; and fig. 6, is a section taken lengthwise of the railway. Figs. 7, 8, and 9, are similar views of another short or half sleeper, which is open at the ends, whereas the other one is brought down at the ends, in the same manner as the sides, thus forming it into an inverted tray-like form. Each pair of short sleepers are connected together by a rod *j*, for the purpose of maintaining the guage; the holes for receiving the ends of these rods may be punched in the sleepers previous to their being laid down, or they may be made after the sleepers are laid down, by means of a carriage mounted on four flanged wheels (set to the proper guage), and furnished with a punching machine at each side. The forms of the sleepers may be varied.

In conclusion, the patentees say, "we do not claim, as of our invention, or the exclusive use of, the several parts of a railway, such as the rails, chairs, and modes of fastening shewn in the drawing hereunto annexed, or hereinbefore described, except when the same are employed in connection with our said invention, which we hereby declare to consist in the manufacture of a sleeper or bearer of malleable or wrought iron, and its application to sustaining the rails of a railway, as above described."—[*Inrolled in the Rolls Chapel Office; May,* 1845.]

To JOSEPH WEIGER, *of Vienna, but now residing at Leicester-square, in the county of Middlesex, doctor of medicine, and surgeon dentist, for improvements in the amalgamation, alloying, and soldering of certain metals.*—[Sealed 12th December, 1844.]

THIS invention consists in improvements in the amalgamation, alloying, and soldering of gold, silver, platinum, palladium, and the compounds of such metals; which improvements are chiefly intended to be employed in the fabrication of the plates, springs, wires, &c., used by dentists in adjusting and fixing human teeth, whether natural or artificial, and also to aid in the fabrication and modes of fixing artificial teeth.

The patentee produces an alloy of platinum with gold, in certain proportions, as hereinafter stated, or an alloy of platinum with silver, or an alloy of platinum with a compound of gold with silver, or an alloy of palladium either with gold or silver, or with a compound of gold with silver, by the following processes and arrangement of apparatus:—First, with reference to silver, the silver is purified by the usual process of dissolving it in nitrous acid; next, precipitating it with muriatic acid, or with a solution of culinary salt; and afterwards decomposing the product so obtained, by treating it with vegetable alkali or colophany. As regards gold, chloride of gold is produced by digesting gold in nitro-muriatic acid, composed of one part strong nitric acid to two parts muriatic acid; and pure gold is obtained from the foregoing digestion, by treatment in a solution of sulphate of iron. As regards platinum, chloride of platinum is produced by digesting the metal in nitro-muriatic acid; and the chloride of platinum being then treated with sal-ammoniac, affords a triple salt, in a yellow powder, which is converted into pure platinum by subjecting it to a red heat, in the furnace hereinafter described. Palladium is obtained by treating native platinum according to the well-known methods.

The before-mentioned metals, or the compounds thereof, are then subjected to a further process in the furnace represented in Plate XVII.

Fig. 1, is a sectional elevation of the furnace; and fig. 2, a horizontal section in the line *y*, *z*, of fig. 1. *a*, is a crucible, placed upon a stand *b*; and *c*, is another crucible, placed in an inverted position upon the mouth of the lower crucible *a*. In the bottom of the upper crucible an opening *d*, is formed, through which the air, that passes through both crucibles, escapes into the chimney; and there is also an aperture at its upper edge, fitted with a fire-door *e*. A small square ash-hole *f*, is formed in the crucible *a*, near its bottom, and is closed by a plug or stopper *g*, composed of refractory substances, such as pieces of broken crucibles, &c.; and several small apertures *h*, *h*, are made in this crucible, at a small distance from the bottom, to receive a series of short nozzles *i*, *i*, projecting from an annular tube *j*, surrounding the crucible, into which air enters through the passage *k*, and then passes through the nozzles *i*, *i*, into the interior of the crucible, so as to act on the fire, and the matters subjected to the process. On the block *l*, set in the centre of the crucible *a*, a small crucible *m*, is placed, to contain the metals which are to be operated upon. The stand *b*, upon which the crucibles *a*, and *c*, rest, also supports a cylindrical iron case *n*, that surrounds the two crucibles, and is filled with powdered charcoal, sand, or other imperfect conductor of heat. Although the patentee describes this furnace, he does not confine himself thereto, as furnaces of any suitable form, construction, or materials, may be used.

The several metals, before mentioned, are prepared for the process of compounding them in the following manner:—For gold, silver, platinum, and palladium, the gold, silver, and palladium, are first to be fused together, and the platinum gradually added to the mass, in a comminuted state, and so subjected to the operation of the furnace. Or, if such metals are already in the form of leaves or thin sheets, the leaves or thin sheets must be formed into rolls of small diameter, and such rolls cut into small pieces, which must be spread open, and again formed into still smaller rolls; or such metals may be reduced to the state of wire of small diameter. Borax is used as a flux, in the proportion of one-fifth of the volume of the metals under operation; and to this flux, tartrate of potassa is added, in the proportion of one twenty-fifth part of the volume of the metals under operation. In conducting the process of fusion, as before described, the fusion of the gold or silver is caused to take place first, and then the required quantity of platinum or palladium is added to the metal or metals already fused; and, in the case of platinum, such addition is made gradually and slowly: the fluxes are added to the mass of metal at or near the commencement of the process. When the gold or silver is in the state of powder, the platinum is also reduced to powder; and after those metals have been intimately mixed, the mixture is fused. In all cases, the platinum must be either in the state of what is termed spongy platinum, or be reduced to small pieces.

The relative proportions of the several metals used in the processes before described, are as follows:—For one composition, the patentee takes 2 parts platinum, and 1 part gold. For another composition, 4 parts platinum, 1 part gold, and 1 part silver. For another composition, 2 parts platinum, 1 part palladium, and 1 part silver. For another composition, 9 parts platinum, 2 parts gold, and 1 part silver. For another composition, 6 parts platinum, 2 parts gold, and 1 part silver. For another composition, 2 parts platinum, and 1 part silver. For another composition, 10 parts platinum, 6 parts gold, and 8 parts palladium. For another composition, 14 parts platinum, 6 parts silver, and 4 parts gold. These proportions may be varied according to circumstances, as in some cases lightness of weight is requisite, in others elasticity, and in some a more decidedly golden color;—the most perfect imitation of gold, as regards color, is produced by a composition of 8 parts gold, 3 parts platinum, and 1 part silver.

The composition used in the process of soldering, is composed of pure gold, or silver, or of pure gold and silver combined. Platinum is soldered with pure gold or silver, or with a composition of pure gold and silver; and compositions of platinum are soldered with pure gold. A composition of 2 parts silver, and 1 part gold, is used to solder any other metals or their compounds.

The patentee states, that he applies the compositions, before described, to any purposes in the constructive arts to which their metallic properties render them advantageously applicable.

The patentee says, in conclusion, "Having now described the nature and intention of my said invention, and also the manner in which the same is to be carried into practical effect, I declare that I claim, as of my invention therein, the compositions, the processes, and the means of conducting them, prepared, compounded, and conducted, as they are severally herein described, for the purposes, and the applications to the objects of my said invention, and as such objects are hereinbefore set forth."—[*Inrolled in the Rolls Chapel Office, June,* 1845.]

To James Smith, *lately residing at the Cross Keys Hotel, Wood-street, in the city of London, engineer, for improvements in printing or ornamenting various fabrics.*—[Sealed 7th December, 1844.]

This invention consists in printing various descriptions of figured or ornamental lace fabric with devices or patterns in colors or metals; the process being only applicable to (or intended to be claimed for) printing upon such portions of the lace as are formed in figures, by what is called cloth-work, or solid compact woven, or otherwise closely worked, foundation.

The manner of effecting these improvements is as follows:—Having devised a certain pattern or figure to be wrought in lace in ground-work, or compact foundation, by the machinery and means which are known and practised for that purpose, the patentee prepares printing blocks, cylinders, or other printing surfaces (similar to those commonly used for printing patterns or devices upon silk, cotton, and other fabrics,) such block, cylinder, or printing surface, being formed or cut to such patterns or devices as will correspond with, and work upon those parts of the fabric only which have a solid or compact cloth-work, or other compact foundation wrought in them. Figured lace having been thus produced, it must be bleached, or otherwise prepared, as may be required, in the ordinary way, and got up or dressed evenly and smoothly, but with a very slight degree of stiffening (if any); the lace is then to be laid and stretched out flat and tight upon a table, in the same way as other fabrics and paper are usually laid out to be printed. When this is done, the blocks, cylinders, or other printing surfaces, charged with the coloring matter (or adhesive composition to hold color, or thin sheets of metal, or powdered metal, to be afterwards applied), are to be carefully placed upon the wrought patterns or foundation work of the lace, and the impression given to those parts of the work in the same way as is usually practised by printers.

The patentee states, that he does not intend to claim printing upon lace in general, or upon any other fabric, but only printing upon such parts of figured lace as are wrought with patterns or devices in cloth-work, or other close compact ground, capable of receiving the coloring matter, and shewing up the devices or figures so printed.—[*Inrolled in the Petty Bag Office, June,* 1845.]

Specification drawn by Messrs. Newton and Son.

To William Henry Barlow, *of Leicester, civil engineer, for improvements in the construction of keys, wedges, or fastenings, for engineering purposes.*—[Sealed 6th March, 1844.]

The novelty of this invention consists in substituting in place of solid metal or wooden wedges or keys, now employed for engineering purposes, a peculiar construction of fastening, made of hollow metal, by which means a degree of elasticity is obtained, together with lightness and strength.

In Plate XVIII., figs. 1, and 2, are front and end views of a railway chair, shewing the rail fixed in its seat by means of the hollow wedge. *a,* is the chair; *b,* the rail; and *c,* the hollow wedge (made of wrought iron) which is driven between the rail and the chair. This wedge is made into a perfect tube, by welding its parallel edges together, and, if thought necessary, one side of the tube may be flattened to fit the side of the rail. The patentee, although he prefers the wedges or keys to be welded (a less thickness of metal being in that case required to give the necessary strength and elasticity), states that they may be employed without welding, but that the edges should abut against each other.

Another mode of constructing hollow wedges or keys for securing the rails of railways, is shewn at *c*, figs. 3, and 4: the wedge in this case is similar to a link of a chain.

Hollow wedges formed like a tube are also employed for securing the chairs to their sleepers, as represented at *d, d*, figs. 1, and 2: tubes, either welded or not, may be used for this purpose, as shewn at figs. 5. The patentee states that, although he has shewn the exact form of wedges, keys, or fastenings, which he has used, he does not confine himself to these particular forms; but he claims the mode of making keys, wedges, or fastenings, for securing railway bars in the chairs, and securing railway chairs to the sleepers or blocks, and for other engineering purposes, by forming them of hollow metal, as above described.—[*Inrolled in the Inrolment Office, September*, 1844.]

To Alphonse Le Mire De Normandy, *of Dalston, in the county of Middlesex, gent., for improvements in purifying lac, and in converting lac into shellac.*—[Sealed 7th December, 1844.]

The first part of this invention consists in a method of ridding lac of the impurities contained in it, such as twigs or branches, dust, dirt, and other matters, and converting it into pure lac, or into shellac.

The lac is laid on a sieve, and immersed in alcohol, or other menstruum in which it is soluble, but which, after evaporation, will leave the lac unaltered in respect to its properties. Heat may be employed to expedite the process of dissolving the lac; it is best applied by means of steam pipes, or Perkins' hot water pipes; but other modes of applying it may be resorted to. The vessel that contains the menstruum is preferred to be in the form of a still, provided with a worm tub, so as to be able to condense the vapours arising during the operation. When the lac is completely dissolved, the sieve, which now contains only the impurities, is removed; heat being then applied to the still, containing the solution of lac, the alcohol or other menstruum will evaporate (and may be collected separately), leaving the lac in a melted state. The purified lac may be converted into shellac, by letting it fall, while in a melted state, upon a pair of revolving metal rollers, the surfaces of which are kept moist and cool by the application of water; these rollers press the lac into a thin sheet, which is allowed to slide down an inclined plane of sheet iron until cool: for this purpose, the sheet iron plane must be about forty feet long, with a suitable inclination for causing the lac to slide slowly down.

The second part of the invention consists in a mode of manufacturing shellac from seed lac, block lac, roll lac, or lac pieces, and likewise reconverting into shellac any lac which, having been previously in the state of shellac, has become clogged or run together in blocks or pieces.

The patentee coils a pipe into the shape of a funnel or cone, the sides of which incline towards each other at an angle of about 60° (the coils being about a quarter of an inch apart); and it is placed above a pair of revolving rollers. Steam is introduced into the pipe, at a pressure of about 50 lbs. to the inch; or water, at a temperature of from 260° to 300° Fahr., is allowed to circulate through it. The lac being put into the funnel, becomes melted, and falling upon the revolving rollers, is converted by them into shellac.

This apparatus may also be employed for purifying lac, by covering the inside or outside of the coils of pipe with wire-cloth, to retain the impurities of the lac.

Although the patentee prefers to coil the pipe into the shape of a funnel or cone, it may be coiled into other forms.

The patentee claims, Firstly,—the purifying lac by solution or heat, by passing it through a sieve, to separate it from impurities; and converting the lac into shellac, as above described. Secondly,—the converting lac into shellac by melting, aided by rollers, and cooling the shell or shellac as above described.—[*Inrolled in the Inrolment Office, June,* 1845.]

To Benedict Albano, *of Piccadilly, in the county of Middlesex, civil engineer, for improvements in preparing materials, and applying them to the manufacture of ornamental mouldings, and other useful purposes,—being a communication.*—[Sealed 5th October, 1843.]

This invention consists in preparing fibrous materials in combination with certain adhesive matters, so as to render them suitable for making ornamental mouldings and other embossed articles, and for various other purposes.

The fibrous materials (whether hemp, flax, cotton, or other suitable fibrous substances be used,) are first opened out by any suitable machinery; and then submitted to the action of a carding-engine, in order to obtain the fibres in a uniform sheet. These sheets are successively placed upon an endless travelling cloth, mounted on two rollers, which cloth carries the sheets towards a pair of wooden pressing rollers, covered with felt; in their progress towards the pressing rollers, boiling water is thrown on them, in small streams, from a vessel above, and then, by the action of the pressing rollers, the water is expressed, and the fibrous material compressed. After this preparation, the sheets are rolled, and kept in readiness for the subsequent treatment which they have to undergo.

70 parts, by weight, of mineral or gas tar, and 30 parts of rosin, are now melted together; then 15 parts of oxide of manganese are stirred in, and the whole boiled for five or six hours; at the expiration of this time, the composition is allowed to settle, and the liquid is drawn off into a vessel, to be ready for use. Another composition, consisting of 75 parts, by weight, of linseed oil, 25 parts of rosin, and 10 parts of oxide of manganese, is now made, in the same manner as the first. These two mixtures are put into a suitable trough or vessel, and, when thoroughly combined, by the action of stirring, and a gentle heat (produced by steam-pipes or other means), the dry sheets of fibrous material are introduced: when the sheets become well saturated with the hot mixture, they are passed between a pair of heated pressing rollers, at one end of the vessel, by which means the fibres will be

closely pressed together, and the excess of mixture expressed therefrom; the sheets are then dried, by placing them on open iron frames, in a hot-air stove. The sheets are next dipped into linseed oil, with which about 30 per cent. (by weight) of yellow ochre has been mixed, and the excess of oil is expressed by rollers.

The sheets, prepared in the manner above described, are in a suitable condition for being embossed, by means of dies. The patentee makes the concave lower die by the ordinary process of die-sinking; and from it he produces a concave die or punch of a compound metal, consisting of 86 parts, by weight, of lead, 4 parts of tin, and 10 parts of regulus of antimony, which are melted together, and run into the concave die. The sheets are cut into pieces suitable for the dies employed, and, after being softened by means of a hot air stove, are placed upon the concave die, which may be either heated or cold; the convex die or punch then descends, and presses the sheet into the concave die. When the embossed articles are removed from the concave die, they are placed in a hot-air stove, on wooden or other trays, and kept there until quite dry, which will be in about twenty-four hours; they are then coated over, inside and out, with a composition, consisting of rosin, dissolved in about one quarter of its weight of boiled linseed oil, and a sufficient quantity of essence of turpentine, so as to keep it in a liquid state when cold, together with as much yellow ochre as will be required to obtain a thick yellow color; after which, the articles are dried, and then submitted to pressure in the dies whilst warm: if the impression is not sufficiently sharp and complete, another coating, inside and out, of the composition, and a further pressure in the dies, may be resorted to. After the above preparation, the articles are to be laid by for forty-eight hours; the inside of each article is then coated with strong animal size, mixed with Spanish white, and, when dry, the edges are trimmed off; to the outside, two coats of gilding size are applied, and, when dry, a coat of Spanish white, which has been finely ground, sifted, and mixed with oil and essence of turpentine, is laid on: the articles are then ready for use.

When the sheets of fibrous materials are not to be embossed, but to be used in panels, or for covering walls, they are (after being stoved) dipped in the mixture of linseed oil and yellow ochre, and passed between pressing rollers, as before mentioned; they are then dried in a hot-air stove; after which, one surface of each sheet is polished, first with brick or hearth-stone, and next with pumice-stone and boiled linseed oil; they are then dried; and afterwards the surface is coated over with Spanish white, ground in strong size: when dry, the sheets are ready for the decorator or painter.

If the sheets are to be used for more common purposes, then, after they have been saturated with the composition above described, they are coated on either side with tar, combined as above described.

Although linseed oil is directed to be used in the mixtures above described, other oil may be substituted; and other dryers may be employed, instead of oxide of manganese.

The patentee claims, as his invention, the means of preparing fibrous materials into sheets, as above described, and applying them to the manufacture of ornamental mouldings and embossed articles, and other uses; he also claims the making of counter dies or punches, as above described.—[*Inrolled in the Inrolment Office, April,* 1844.]

REPORTS OF AMERICAN PATENTS.

From the "Journal of the Franklin Institute,"

EDITED BY DR. THOMAS P. JONES.

To FRANCIS M. STETSON, *of Sangerfield, and* JOHN EATON, *of Brookfield, New York, for an improvement in setting logs on saw mill carriages.*

THE slides on the head and tail blocks of the carriage to which the dogs are attached, are moved by means of screws, in a manner well known to those who are acquainted with saw mills; and for the purpose of operating the two screws simultaneously, they are connected by bevel cog-wheels, and a shaft extending from the head to the tail block, and parallel with, and at the side of, the carriage; the bevel cog-wheel on one end of the shaft being adapted to the shaft by a feather, or square socket, and connected with the tail block by a collar, so that the tail block can be moved towards, or from, the head block.

Claim:—"What we claim, as our invention, is the connecting together the screws and sliding blocks on the head and tail blocks of the carriage, so as to move both ends of the log simultaneously and equally, and at the same time allowing the head blocks to recede from, or approach to, the foot block, and thus be adjusted to the length of the log to be sawed, the whole being arranged, combined, and connected substantially as set forth and described."

To SAMUEL NICHOLSON, *Boston, Massachusetts, for an improvement in the ice breaker for boats and other vessels.*

THE bow of the boat is to be provided with ice cutters, or breakers, attached to a rotating shaft actuated by a steam engine, or with permanent cutters moving with the boat; these instruments cut the ice, forward of the boat, into strips, which are broken off and forced under the surface of the water by an inclined shield attached to the bow of the boat, provided with two projecting inclined surfaces that run obliquely from the middle of the forward end to the sides, to force the broken under the unbroken ice beyond the paddle-wheels of the boat, and thus clear the channel.

Claim:—"What I claim, as my invention, is making the shield, or shoe, at the bow, to consist of a combination of inclined surfaces, arranged as herein described, so as to depress and carry the ice under, and on each side, the shield being as wide, or nearly so, as the extreme width across the paddle-wheels by which the boat is propelled."

To HENRY STANTON, *Richfield, Otsego county, New York, for improvements in saw mills.*

THESE improvements are for the purpose of more effectually steadying the log, whilst under the action of the saw. The first improvement consists of a bar extending from the slide of the head to the tail block, attached permanently to one, and so connected with the other as to admit of changing the distance between the head and tail blocks for different lengths of logs. Towards the middle of the length of this bar there is a bail and sliding dog, by means of which the middle of the log can be dogged to steady it; and the other improvement consists simply of a metallic plate attached to, and projecting above, the rebate of the head and tail blocks, to fit into grooves cut across both ends of the log, to prevent it from slipping endwise.

Claim:—"What I claim is, first, the arrangement of the longitudinal bar and dogs attached to the ends of the slides of the head and tail blocks for supporting the log at the middle, in the manner described; second, the arrangement of the vertical plates on the head and tail blocks, for entering notches made in the under side of the log, to prevent it having any movement longitudinally whilst being sawed, as described."

To Lauren M. Peck, *Philadelphia, Pennsylvania, for an improvement in the bench vice.*

The patentee says :—"The object of my improvement is the so constructing of a vice that the jaws thereof shall adapt themselves to articles of unequal thickness, such, for example, as are tapering, or wedge-formed, and which cannot, therefore, be securely held in those of the ordinary construction. This end I attain by allowing one of the jaws, most commonly the front, or moveable, jaw, to turn in a socket, like the T of a lathe rest, or otherwise to swivel on a joint, or pin, so that it may move to the requisite distance; and to admit of its so doing, I furnish the screw with a ball and socket joint, where it bears against the moveable jaw; or, instead of this, I allow the screw head, or rather a washer, under it, to bear upon two projecting pieces of hardened steel on the fore side of the jaw of the vice, the said two projecting pieces being in a vertical line with each other."

Claim :—What I claim, is the causing of one of the jaws of a vice, and that usually the front jaw, to swivel, or turn, in a socket, or on a gudgeon, or joint pin, for the purpose of enabling it to embrace an article firmly which may be tapering, or of unequal size at its two ends; the same being effected on the principle, or substantially in the manner, herein set forth."

To Enoch Huse, *Newburyport, Essex county, Massachusetts, for a process for renovating tobacco, after it has become mouldy.*

This process consists "in immersing, or soaking, the package of tobacco in water for five minutes, or upwards, as circumstances may require; and as the tobacco is usually packed in boxes, or kegs, these are generally introduced, filled with damaged tobacco, into the vat of water. This being accomplished, and the water having penetrated the tobacco to the necessary degree, which a little practice will soon enable a workman to determine, the tobacco is next removed from the vat, and put into an oven or drying room, and there subjected to such a heat as may be necessary to entirely, or nearly, dissipate the water, and destroy the mould; the said heat varying, according to circumstances, from one hundred degrees of Fahrenheit, to such a heat as the article will bear without scorching, or burning, to an injurious degree. In order to produce this heat, any of the known modes may be adopted; the article is then subjected to powerful pressure, in the same manner as tobacco is usually pressed into boxes, or kegs, for the merchants, or market.

To Cyrus Kenney, *Troy, Renssalaer county, New York, for a machine for trimming the blanks in the manufacture of butt hinges.*

"The butt hinges that are to be manufactured by the aid of my machine, are such as are formed from wrought-iron, or other malleable metal. In the manufacture of such hinges, the flaps, or halves, of the hinge are first cut out of rolled, or sheet, metal, with the pieces projecting from one side thereof, which, when bent, are to form the knuckles of the hinges, this cutting being effected in a manner well known. In the process of bending the knuckles formed from the projecting pieces, these become elongated, so that the two sides, or halves, of the hinge will not come together, until reduced to the width they had before being bent. The machine covered by this is intended to remove this difficulty by cutting, or trimming, off a small portion from the sides of the projecting pieces, before they are bent, and made into knuckles." For this purpose there are gauges that fit between the projecting pieces before being trimmed, attached to the under part of the trimming cutters, or dies, operated by a lever, and acting against bed dies which aid in shearing off the surplus metal. The dies and gauges are regulated by set screws.

Claim :—"What I claim is the manner of arranging and combining the dies and gauges substantially as described and set forth in the specification."

To Horace Baker, *McLean, Tompkins county, New York, for improvements in machinery for making barrels, firkins, &c.*

After the staves have been shaved in the usual way, they are clamped in a curved bed attached to a swinging frame, the centre of vibration of which corresponds with the centre of the barrel, and by means of this swinging frame they are presented, first, to a circular saw, which cuts off the surplus wood, and then to a straight reciprocating jointer. After this operation, all the staves for a barrel are put together between two circular plates, on a lathe, with teeth for holding them firmly, and then turned off by means of cutters attached to a stock which slides transversely on a carriage that moves from end to end on ways ; the stock being so arranged as to embrace a guide of a curve corresponding with the bilge of the barrel.

Claim :—"What I claim is the employment of the swing frame constructed and arranged as described, in combination with the edging and jointing machines, in the manner and for the purpose specified. I also claim the method of holding the staves for turning, in combination with the moveable, double-motion, cutter carriage, arranged and constructed as before specified."

To Edward Savage *and* Simeon North, *Middletown, Middlesex county, Connecticut, for improvements in fire arms.*

This is for an alleged improvement in the mode of constructing guns, &c., that load at the breech, by making the breech part of the barrel separate and moveable; the back part of this section turning on a joint pin in a socket, that the forward part may be thrown up sufficiently to receive the charge; and consists in a mode of insuring the coincidence of the moveable section with the permanent part of the barrel, after being charged, and an arrangement of parts for giving the requisite movements. On each side of the moveable section there is a strap, one of which is cut out to receive a shoulder, (called in the specification a permanent chock,) on the side of the moveable section, and the other adapted to receive the joint pin, or spindle, of a tumbler that embraces a circular projection on the other side of the moveable breech, so that by the turning of this tumbler it is thrown up, or down; the spindle of the tumbler being provided with a hand lever, one end of which is cam-formed, and acted upon by a spring, to insure the complete movement of the parts.

Claim:—"What we claim is the combination of the tumbler chock with the receiver, (breech) in the manner and for the purpose set forth. We also claim, in combination therewith, the permanent chock, constructed and arranged as set forth. We also claim the lever and spring, in combination with the tumbler, chock, and receiver, arranged substantially in the manner and for the purpose described."

Scientific Notices.

REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.

(Continued from page 359, Vol. XXVI.)

The author then proceeds to the more immediate details for the reduction of the ore:—

Still, looking at it in its scientific bearings, he cannot but think, that a magnetic iron ore is, as it ought to be, the most easy of reduction, if that reduction be prosecuted on sound chemical principles. He presumes, that he may designate those as magnetic ores, which like the Turkish, contain a proportion of protoxide of iron; but at present he would confine himself to the richer classes only. It seems singular, that this description should be the one universally used (as far as he can learn) in the old bloomeries, or in the improved form of that furnace,—the Catalan Forge. In America—in India—in Prussia, and in Spain, these ores alone seem to be used. Is it not probable, because their state of diminished oxidation renders their reduction more facile, and if readily brought into the metallic state by the crude action of the blast in the bloomery—*à priori*, why should not they, when once in that state in the high blast furnace, be as readily impregnated with carbon to make cast iron?

He looks upon it, that the reason why the English iron-masters of the present day consider the reduction of the rich ores a matter of such doubt and difficulty, is, because they have only tried them, and always treated them as of the same family as the leaner iron stones; and thus, they practically find that they can use them but in small proportions. An extensive iron-master of Staffordshire told the author, that when he added more than one-fourteenth part of the rich Ulverstone ore, he always endangered the "gobbing up" of his furnaces. Now this was to be expected;—with the red ore, he was using only the same quantity of carbon, as if that much of some calcined "lean mine" had been used. When told he must use more coke, he declined, on account of the extra expenditure of fuel, forgetting, that the larger proportion of oxygen in the ore would require a larger dose of carbon, both for its decomposition and the impregnation and smelting of the greater quantity of iron produced.

From all he can gather, the writer thinks, that the only difficulties about the smelting of the Samakoff ore, are its specific gravity, and the fineness of its particles; it would thus be carried down too rapidly through the decomposing region, into the hearth of the furnace, and thus the carbon in the upper parts would be rendered inoperative. With furnaces of a more cylindrical form, he considers that this evil might be, in a great measure, avoided; there would not be that tendency to rapid descent of the portion of the "burden" in the centre, which the egg-shaped sides of the present charcoal furnaces seem necessarily to cause; but the whole charge would settle equally and regularly, as the portion below was reduced and consumed. Such shaped furnaces may suit ores, even as fine as those from Samakoff, but until they are fairly tried, there may be great doubt of the result, and it was to the alternative of the two evils,—a strong blast, which blew the ore out of the top of the furnace, or a weak one, which let it fall too rapidly to the bottom, that the defective quality of the iron, previously made, was ascribed.

To avoid all risk of suffering from either of these evils, the writer recommended a modification of the process which he had invented, for the production of wrought iron direct from the ore, and after trying it in a small way in a common foundry cupola furnace at Mr. W. Fairbairn's works, at Manchester, with encouraging success, a larger quantity of the ore was procured from Turkey, and the process was tried on a more practical scale at the

Backbarrow charcoal furnaces, which the liberality of Messrs. Harrison, Ainslie, and Roper, had permitted him to use.

The writer now proceeds to detail the results of this trial, apologizing for the apparent prolixity of the preceding matter, trusting that the results of the experiments may be deemed more professionally interesting, particularly as bearing upon what must be an object of such vital importance in every branch of engineering,—the quality of cast iron.

1120 lbs. of the Samakoff ore, imperfectly freed from the silex by washing, were mixed up with half that weight of the riddlings of charcoal (a comparatively valueless residuum from the blast furnaces); this charcoal 'breeze' being fresh washed, to free it from dirt, must have contained, at least, one-third of its weight of water. The mixture was thrown into a common puddling furnace, and lightly stirred about every 5 minutes: at the end of 35 minutes, the mass having become pasty, and palpably 'coming to nature,' was withdrawn; on being cooled, it was found to weigh 867 lbs., the loss of weight showing, that the deoxidation had been pretty far advanced. The quantity was so small, that it was difficult to fix on any mode, by which the product of the Turkish ore could be satisfactorily separated from the current burden of the furnace: after some consideration, Mr. Roper, junior, the manager of the works, decided on proceeding as follows:—

At six o'clock on the evening of the 8th December, 1843, the customary charges of hæmatite ore, in the Backbarrow furnace, were stopped, and 'false charges,' that is, charcoal, lime, and other flux, without ore, were continued to be used, till 10 o'clock; it was then considered, that a complete separation would be made by this great quantity of charcoal, &c., between the last ore charged and what was now to be used. The Turkish ore was then used, in like weights, with their customary charge, and the last charge was put in at midnight. About this time the furnace was tapped, and a charge of white iron run out.

No variation in the working of the furnace took place, until ten o'clock A.M. of the 9th, when it was clear to the workmen, and was soon ascertained by Mr. Roper, that the furnace was working 'light,' *i. e.*, making little or no iron; in other words, that all the ore charged previous to six P.M. of the previous evening, or very nearly all, was then in a state of fusion, in the hearth of the furnace, as pig iron; it was consequently tapped,—less than the average quantity of iron (as was to be expected), but of grey quality, was produced. The furnace still worked 'light' for two hours more, say to half-past twelve, when it began again to 'make iron.' No great change took place till half-past three, when a cinder, quite novel in its appearance, but by no means of bad quality, was tapped; it was also accompanied with the dust of the ore which had not (as usual) been separated by riddling; at four o'clock the hearth was tapped, and an excellent lot of very fluid pig iron was obtained. This had also some marked characteristics:—after becoming comparatively cool, it was still fluid, and the workmen universally acknowledged appearances, which they had never seen, when false charges (as is frequently the case) had been used with the usual materials. The quantity rather exceeded in weight, the deoxodized ore introduced; but this could scarcely be avoided, as the furnace must have been making some iron from its old stock, between half-past ten and half-past twelve o'clock. The opinions, both of Mr. Roper and his men, were unanimous, that both from the means used, and the phenomena exhibited, at least four-fifths of the iron made was from the Samakoff ore.

In the customary mode of making best charcoal bar iron, from charcoal pig, it takes very nearly 30 cwt. of such pigs to produce 20 cwt. of best hammered bar. Of this Turkish pig iron, it only took 26½ cwt. to produce a like quantity. That this remarkable difference is an effect of the preparation or deoxidizement of the ore, is proved, by the same results following a trial with the Ulverstone ore deoxodized; for 26 cwt. of pig, made in a previous trial from such prepared ore, in like manner produced 20 cwt. of bar. Time and opportunity have not yet been given to investigate the cause of this striking and important phenomenon; but the author thinks it will be found, that pig iron so made from deoxidized ore, will contain no foreign matter but carbon, and all the silicon and other adulterative matter, present in cast iron, as customarily made, will no longer exercise their prejudicial effects on the quality. He does not mean to propose, that all cast iron should be made from ore deoxidized in a previous operation, for the expense would be palpably too great; but as respects charcoal iron, there is rather an economy than otherwise, in so preparing the ore, for the deoxidation by means of the hitherto waste 'breeze,' and the coal for fuel in the puddling furnace will, in his opinion, save the consumption of one-half of the charcoal, that would otherwise be used in the blast furnace. This is his conviction, and upon this he intends to act, when he undertakes the direction of the Sultan's Iron Works; but as he has not yet facts to refer to, he leaves for the present the further description of the subject.

He then gives the result of the experiment for producing wrought-iron direct from the Samakoff ore, by the method invented by the author:—

222 lbs. of this ore and 77 lbs. of coke dust, ground fine, were thrown into a furnace of Messrs. Rushton and Kersley, at Bolton; the mass was stirred about for 25 minutes, and then 222 lbs. of Bowling pig-iron were added: in an hour and a half from first charging, 317 lbs. of excellent puddled bars were obtained. If the weight of the Bowling pigs be deducted, it will give 95 lbs. of iron, as the produce of the 222 lbs. of ore, or 44½ per cent.; but if one-ninth be taken from the Bowling pig (a very moderate

computation) for 'yield,' there remains 120 lbs. as the produce of the Turkish ore—above 54 per cent.

Having given a full account of Mr. Clay's treatment of the finer pulverised ores of Samakoff, and of those of Ulverstone, by his process of cementation in the reverberatory furnace, Mr. Fairbairn does not consider it necessary to recapitulate the observations as to Mr. Clay's success, in producing a perfectly crystallized grey pig iron; the facts adduced are proofs of the soundness of his views, and of the efficiency of the measures adopted for that purpose. It may, however, become a subject for consideration and experiment to ascertain, whether or not a cheaper and more direct process of deoxidation could be adopted; and as new discoveries, as well as new methods of application, are of vast importance in the conversion of the mineral products, it may not be improper briefly to consider the proposed method of smelting the fine ores, and further, to inquire into the nature of Mr. Clay's new system of producing iron in its malleable state (without the intervention of the previous process of smelting), direct from the puddling furnace. Taking them in their separate order, the first will be—

SMELTING.

As the infusion of carbon, and the consequent expulsion of the excess of oxygen from the rich ores, may be considered a necessary, as well as a preliminary process, it is obvious, that the plan of stirring and roasting in a separate furnace, as adopted by Mr. Clay, is both tedious and expensive; and now that he is engaged by the Turkish Government, for the purpose of carrying out a more complete and comprehensive system of manufacture, it appears worthy of the skill and consideration of the chemist and metallurgist to cheapen the process, and, if possible, to effect the deoxidation of the ores by one direct operation on the top of the furnace. If the ores can be deprived of their oxygen in this way, by alternate layers of charcoal and coke, there scarcely exists a doubt, but the finer particles of the pulverized ores will receive their proportionate dose of carbon, previously to their descent to the point of fusion in the furnace.

In the preparations for smelting, the past experience of Mr. Heath, and the knowledge of his treatment of similar ores at the works of Porto Nuovo, insures greater certainty in the operations under consideration. It is probable, that the simple method of moistening the ores with water, might answer every purpose of cementation, and by the introduction of the hot blast, the whole process of deoxidation and fusion might be effected in the furnace, at one and the same time, without the intervention of a separate system of preparation. It is understood, that Mr. Heath adopted this method with complete success at Porto Nuovo, and provided it can be accomplished, in the instance of the Samakoff and Ulverstone ores, it will effect a considerable saving in time, labour, and expense.

Should it, however, not succeed, there is still in reserve the preparatory process in a separate heating furnace, as adopted by Mr. Clay. But a few trials of the carbonizing effects of the hot blast on the top of the furnace, will determine these matters, and will shortly point out the most direct and most economical process of carburation.

As respects the dimensions of the furnace to be used, it is decided to make it 40 feet high, 9 feet diameter at the boshes, and 4 feet diameter, with a height of 6 feet 6 inches in the hearth.

This will be looked upon as a small furnace, when compared with those used in this country for reducing the leaner ores; but when it is considered, that the nature of the materials is different, and that charcoal with a slight admixture of lignite will be used, instead of raw coal, and coke, it is probably of the best proportions that could be adopted for such a purpose. The small furnace has, in every instance, been used by Mr. Heath, at Porto Nuovo, and the same description of charcoal furnace is now in operation under the direction of Mr. Roper, at Backbarrow, near Ulverstone.

PUDDLING.

For the conversion of such iron ores as the Ulverstone and those of Samakoff, into the malleable state, it would appear, that Mr. Clay's new process is the cheapest, and probably the most efficient, that can be employed.

On the old plan, when a superior quality of wrought iron is required, a long series of consecutive operations is necessary; and as these operations are both tedious and expensive, it becomes desirable to dispense with the process of the ponderous blast furnace, and to encourage the more direct action of the puddling process, as pursued by Mr. Clay.

In the description given to the Institution of Civil Engineers on a former occasion, the operations of the old plan are stated to be:—

1st. Smelting in the blast furnace.
2nd. Refining.
3rd. Puddling, hammering, and rolling.
4th. Cutting up, piling, and rolling.
5th. Cutting up, piling, and rolling.

All these processes require a separate application of heat.

On the new plan, the operations are reduced to two, viz.:—

1st. Puddling, hammering, and rolling.
2nd. Cutting up, piling, and rolling.

This latter process, according to the author, brings out the iron, superior in quality, to the fifth operation of the old system, and with the advantages of saving a considerable portion of time, and a great quantity of fuel.

The manufacture of this description of iron, direct from the ore, appears to be simple and effective. The requisite preparations would be four or six puddling furnaces attached to the rolling mill, and with a proper mixture of ground charcoal, the charges might be puddled and worked off at a comparatively low rate. After the balls or blooms are formed, they are brought under the hammer, and from thence to the rolls, where they are formed into rough bars; these bars are then cut up into lengths, and piled or shingled; after which they are again heated, hammered, and rolled into finished bars, and, being cut at the end and straightened, are ready for the market.

This appears to be the whole of Mr. Clay's process, except the pounding and cleansing of the ores, which require care and attention, previous to the mixing with the coal or coke.

In the Samakoff ore, the necessity of cleansing for this process will, it appears, be indispensable, as the silica will require to be removed, and the ore cleaned from impurities, before it is mixed with the ground charcoal; this is, however, a simple process, which is easily accomplished by the means already described.

May 14th, 1844.

WILLIAM CUBITT, VICE-PRESIDENT, in the Chair.

"The Atmospheric Railway." By Jacob Samuda, Assoc. Inst. C. E.

So much has already been printed, in various publications, descriptive of the Atmospheric Railway, that a minute detail of its operations would, the author feels, be superfluous. He therefore first describes the general features of the system, confining himself to such points as contain most matter of engineering interest.

On this system of working railways the moving power is communicated by means of a continuous pipe or main, laid between the rails, and divided by separating valves, into suitable lengths for exhaustion; a partial vacuum is formed in this pipe, by air-pumps, worked by steam engines, fixed at intervals along the line, or by water-power, if the nature of the country be such as to afford it. These valves are opened by the train as it advances, without stoppage or reduction of its speed. A piston, which is made to fit nearly air-tight, by means of a leather packing, is introduced into the pipe, and is connected to the leading carriage of each train, by an iron plate, which travels through a longitudinal groove or continuous aperture, the whole length of the pipe.

The continuous groove, or aperture, in the top of the pipe, is covered by a valve, made of a double strap of leather riveted between two series of iron plates: the top plates are wider than the groove, and the lower ones fall within it, when the valve is closed, thus completing the cylindrical form of the interior of the pipe, which had been destroyed by the aperture cut in it. One edge of this leather valve is allowed to rise, the other being screwed firmly down to the surface of the pipe. The lifting edge lies, when the valve is closed, against a composition of bees'-wax and tallow, placed in the groove, which serves as a solder. It is rubbed down, and its surface is slightly melted by a heater, which is attached to the leading carriage. This operation takes place on the passage of every train.

The pipe is exhausted in front of the piston. The connecting plate attaches the piston to the carriage, and serves to draw the train when the piston is in operation within the pipe, and to sustain the piston when it is out of the pipe. To this connecting plate is also fixed a frame carrying four wheels, for lifting and sustaining the continuous valve, so as to leave a constant aperture, in order to allow a passage for the connecting plate. The opening is prolonged beyond the connecting plate by the two outer wheels, in order to give sufficient area for the entrance of the external air behind the piston, as fast as it advances. The heater consists of a trough filled with charcoal, having a blade of copper at its lower extremity: this is heated by the burning charcoal, and rests on the surface of the composition, so that by pressing upon and very slightly melting it, as the train passes along the line, the joint is rendered as air-tight as it was before the composition was disturbed by the passage of the carriage.

The main tube is cast in lengths of 9 feet each, which are put together with socket joints, to allow for expansion and contraction. The sockets are caulked about two-thirds full of yarn, steeped in a putty of whiting and boiled linseed oil, with a small quantity of olive, neat's-foot, or other oil, which does not possess drying qualities, to prevent the joint from becoming too hard. When this has been driven in firmly, tallow is pressed in after it, till the remaining part of the socket is about half filled, and the joint is completed by a tarred yarn, which is driven in upon the tallow; as this joint remains soft, the expansion or contraction of the pipes does not disturb it.

The main tube is divided into sections of about 3 miles each, by separating valves opening in the direction in which the trains move. The entrance valve is opened by the wheel of the leading carriage, which depresses a lever outside the pipe, thus disengaging a catch, which allows a weight to fall and to move a slide valve across two openings in the side of the valve box, on either side of the seat of the valve. This causes the air in the chamber to rush into the exhausted tube; and the lower valve, which is attached to the same fulcrum as the upper valve, being in equilibrium, it immediately opens by the external pressure upon it. The disc of the lower is rather larger than the upper valve, and keeps it closed until the slide is moved, in consequence of the superior surface it exposes to the pressure of the external atmosphere. A weight is attached to the fulcrum of the valve itself, and is disengaged by the action of the wheel. Its object is to open the valve, in case of any obstruction or impediment to the proper action of the slide. An exit valve is placed about 30 feet beyond the branch pipe leading to the exhausting apparatus, and thus, when the travelling piston has passed this branch, its advance diminishes the space between it and the valve, and there being no outlet for the air in the pipe, its density is increased as the space is reduced, until the pressure inside the pipe is greater than that outside, and the valve opens. A double set of these valves is employed, where it is necessary to use the same main, for travelling in both directions.

The author then examines the views of George Medhurst, who, he states, to have been one of the first projectors of the mode of conveying passengers and goods at high velocities, by the transmission of fixed power, through the medium of the atmospheric air. His notions on the subject were first published in 1810. In 1812 he again published a work intituled, 'Calculations and remarks tending to prove the practicability, effects, and advantages of a plan, for the rapid conveyance of goods and passengers on an iron road, through a tube of 30 feet in area, by the power and velocity of air.' The calculations in this work are principally confined to the conveyance of carriages inside a tube; but it also states that it may be practicable, on the same principle, to form a tube, so as to leave a constant communication between the inside and the outside of it, and by this means to impel carriages in the open air, with the advantage to passengers of being unconfined, and in view of the country. In 1827, he again published a detailed account of the various means, by which he proposed to effect a communication between the inside and the outside of the tube. The first of these he describes as follows:— "If a round tube, 24 inches diameter, be made with an opening of 2 inches wide in the circumference, and a flanch of 6 or 8 inches deep on each side of the opening, it will leave a channel between the flanches, and an opening into the tube.

"If such a tube is laid all along upon the ground, with the iron channel immersed in a long trough of water, and a piston or box made to fit it loosely, and pass through it upon wheels or rollers, this box, driven through the tube by the air forced into it, may give motion to a carriage without, by a communication through the channel and the water."

Another plan is thus described:—"A plan to combine the two modes together, that the goods may be conveyed by the canal, and a communication made from the inside, to the outside of it, so that a carriage may be impelled in the open air, to carry passengers, would be an improvement desirable and practicable. It must be effected without the aid of water, that it may rise and fall as the land lies; and it must give a continual impulse to the outside carriage, without allowing the impelling air to escape.

"For this purpose, there must be some machinery, which will diminish the simplicity, make it more expensive, and more liable to be disordered, unless executed in the most substantial and perfect manner; but by skill, by experience, and by sound workmanship, it may be accomplished in various ways, one of which I will describe, which, I presume, will evince the practicability of it.

"In order to make this in the best manner, the top of the canal should be made of wrought iron, or copper plates, riveted together, and riveted all along one side, to a cast iron rail, securely laid upon the top of one of the side walls, and made to shut down close upon a cast iron rail, laid firmly down upon the other side wall.

"In order to make the plate shut down air-tight upon the cast iron rail, without being riveted to it, there should be a groove all along the top and inner edge of the cast iron rail, and a thin edge of iron, riveted to the plates all along, to fall into the groove; then, if the groove is partially filled with some soft yielding substance, as cork, hemp, wood, leather, &c., the thin iron edge will bed itself into it, and shut so close, that the air will not escape, with so light a pressure as one pound per square inch.

"The plate that is to form the top of the canal being thus prepared, may be lifted up out of the groove two or three inches high, in any particular place of the side, which is not riveted, and when let down again, the edge will fall into the groove, by the spring and weight of the plate, and stop it close as before. Therefore, if there is a large and light iron wheel fixed in front of the interior carriage, and close to the side of the wall on which the plate shuts into the groove; and if this wheel is planted to stand two inches higher than the underside of the covering plate, this wheel, as it passes along, will constantly lift up the plates, and make an opening of two inches wide, or more, and 8 or 10 feet long; and when the wheel has passed, the plate will fall down into the groove, and close the joint as before. Through this opening, a bar of iron may pass, that is fixed to the interior carriage; it may project over the side wall, and the outer end may be attached to the exterior carriage by a chain or strap, and pull it along upon its own wheels and wheel-track, which should lie along by the side of the walls of the canal. The iron bar will not touch anything as it passes through the opening, for the iron covering may be lifted up two or three inches high; but the bar need not be more than one inch in thickness."

"The same principle and the same form, may be advantageously applied to convey goods and passengers in the open air, upon a common road, at the rate of a mile in a minute, or sixty miles in an hour; and without any obstruction, except at times, contrary winds, which may retard its progress, and heavy snow, which may obstruct it. If a square iron tube be formed 2 feet on each side, 4 feet in area, with three sides, and one half the top of cast-iron, and the other half of the top made of sheet-iron or copper, to lift up and shut down in a groove in the semi-top plate, as before described; and if a strong and light box or frame be made to run upon wheels within the tube, and an iron arm made to pass out through the opening made by lifting up the plate, as before described, this arm may give motion to a carriage in the open air and upon the common road, without any railway, if the pressure within the tube be made strong enough for that purpose.

"The opening of the iron plate should be made in the middle of the top, so that the iron arm may pass out, and stand upright a few inches above the top, to which the strap should be attached, to communicate motion to the carriage.

"The frame, or box, within the tube, should be 10 or 12 feet long, and must be guided by wheels on all sides, as large as can be admitted, and as truly formed and planted as possible; the number will be fourteen or sixteen. A piston or vane must be formed near the middle of the frame, to intercept the air, and must be leathered all round, so as lightly or barely to touch the sides of the tube.

"The inside or middle of this vane should be open, and the opening filled up and closed by a valve, suspended by an axis across the middle of the opening, so that this valve, by turning on its axis, may open the vane, and suffer the air to pass through, and prevent its impulse upon the vane and carriage, or, by closing the valve, intercept the air, and give it motion.

"By this means the conductor of the carriage may restrain and limit the velocity, and stop the carriage, at any time and at any place, by a communication from the valve, through the opening, to the conductor on the outside; and this will be done without the least violence, shock, or chance of disordering anything, either within or without.

"The iron tube should lie in the ground, with the top of it a few inches above the surface; and the carriage should run over it, with the wheels on each side; then the iron arm would draw the carriage in the fairest position. The opening being, in this plan, made in the middle of the top of the tube, instead of the side, the lifting-wheel will act either way, without being removed; but the iron arm that passes through the opening (to draw the carriage), as well as the arm that is to pass through, to open and shut the valve, must be changed to the other side, when the motion is changed to a contrary direction. If the carriage is attached to the regulating arm that is to pass through the opening, and that arm is supported by the main bar, the effect will be, that if by any accident the chain should let go its hold of the arm, the inside valve would instantly fly open, and the vane being no longer impelled, would soon stop of itself, and the chain might be replaced.

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"Although the perfection of this work is not to be attained but by time, skill, and experience, and the wealth of a nation, yet, upon a smaller scale, and less rapidity, the expense will be moderate and within reach; and the value of it, compared with the present mode of conveyance, would be abundantly advantageous and desirable."

The method of working which he proposed to make use of, is thus described:—

"When the carriage is to go through the canal from the engine, the air must be forced into the canal behind it; but when it is to go the contrary way, the same engine is to draw the air out of the canal, and rarify the air before the carriage, that the atmospheric air may press into the canal behind the carriage, and drive it the contrary way."

Such is the history of most ingenious, but unsuccessful, attempts of Mr. Medhurst, to render the atmosphere available as a medium for the application of fixed power to locomotive purposes.* The failure of these, as also of some subsequent attempts, is clearly traceable to the want of a valve, which would close sufficiently air-tight, to allow a useful degree of vacuum to be formed in the main, and, at the same time, present no obstacles to the reproduction of the vacuum, after the valve had been opened and closed down again, by the passage of the train.

The method by which this object is now effected, has been described.

Before proceeding further, it is only justice to state, that the idea of using tallow as a kind of solder for this purpose, was suggested by Mr. Samuda's co-patentee, Mr. S. Clegg; and that it has been wrought into form by his and the author's joint labour.

The operation of the power is thus described:—The first steam engine, being set to work, produces a vacuum in the first section of tube, and when a sufficient rarefaction is created in it, the piston is inserted in the end of the tube, and the separating valve opened; the engine continuing to work, the train advances, as fast as the rarefied air is withdrawn from before it, and when the rarefaction reaches the point at which it will continue uniform, *i. e.*, when it is exactly equal to the resistance of the train, the speed of the travelling piston will be to that of the air pump, inversely as their areas. A slight reduction in this speed will occur, from the leakage of the main, which will be treated of hereafter. When the train commences its motion in the first section of main, a signal is given by the electric telegraph to the second engine-house, and the engine is set to work, so that by the time the first section is traversed, the second is exhausted, and the train, after passing the branch leading to the first air pump, opens the exit valve of the first section, and the entrance valve of the second, and proceeds without any check in the velocity it has acquired; the signal is then given to the third engine-house; the corresponding section is prepared by the time the train reaches it, and so on, for any distance the train has to travel.

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* In the same pamphlet, (page 32), Medhurst speaks of having constructed two steam carriages for common roads; the first was tried with success, April 3rd, 1820, and attained a speed of seven miles per hour.

Several peculiarities exist in this application of power. The first is, the accumulation of power in the main, from forming the vacuum, previous to the arrival of the train. This in proportion to the degree of vacuum formed. At two-thirds of a vacuum, the power accumulated in the pipe, is nearly as great as that necessary to maintain it; thus, if two-thirds of a vacuum be formed before the train enters the section, it will be propelled by nearly twice the power employed to work the air-pump, during its transit; for the mean pressure on the air-pump piston, working at this degree of vacuum, is 5½ lbs. per square inch, and that on the travelling piston is 10 lbs. per square inch, and the comparative speed of the two pistons, necessary to maintain the same degree of exhaustion during the transit, is inversely as their areas.

From the above, some deductions must of course be made, for friction, leakage, &c. The first of these losses is very small indeed. The friction of an air-pump piston is so well understood, that it needs no remark; and that of the travelling piston has been proved by experiments on the 15-inch main, in Ireland, to be scarcely appreciable. The power lost by leakage will be inversely as the speed of the trains; for the faster the piston passes through the section, the less time will it be under exhaustion, and, consequently, the less time will the leakage exist. Thus high velocities will be worked to a greater advantage than low.

A great number of experiments, made on the Dalkey Railroad, show that the surplus power which should be fixed, to overcome the leakage of a main 15 inches diameter, is about 5 HP per mile of main. The mode by which this conclusion was arrived at, is as follows:—By means of an indicator, the total power employed to work the air-pump was ascertained to be 78 horses, when the vacuum stood at the point considered most advantageous to work at, viz. 15 inches to 16 inches of mercury. At this point it was found, that when the whole main was under exhaustion, the engine would raise the gauge 1 inch in 15 seconds, and when the engine was stopped, it sank 1 inch in 41 seconds; therefore the engine pumped out in 15 seconds as much air as leaked in in 41+15=56 seconds, hence $\frac{15}{56}$ of 78 HP, or 20·9 HP, was absorbed $\frac{15}{56}$, to pump out the total leakage.

The amount of leakage, due to the working main and the continuous valve, was then separated from that of the connecting pipe, which was known to be defective, at a part passing under ground. By calculation, the total contents of the main and connecting pipes was shown to be 10,680 cubic feet; therefore the total quantity of air which must have leaked into it, to reduce the vacuum 1 inch of mercury, was $\frac{1}{30}$ of 10,680= 356 cubic feet. This, then, was the entire leakage during 41 seconds. The train was then advanced 5544 feet nearer the air-pump, and the leakage was found to be 197 cubic feet in 41 seconds: as a length of 5544 feet of the main and valve was, by these means, shut off from exhaustion, it is clear that the difference between the first and second experiment must give the leakage due to the portion of main shut off, $\therefore 356-197=139$ cubic feet, is the leakage per 41 seconds of 5544 feet of main and valve, and $159\times\frac{5280}{5544}=151$ cubic feet, the leakage of one mile in the same time; and as it is already shown, that it required 20·9 HP to extract the whole quantity, or 356 cubic feet, as fast as it leaked in, $\therefore 20{\cdot}9+\frac{151}{356}=8{\cdot}86$ HP, the power necessary to pump out the leakage of one mile of 15-inch main and valve; but as the train piston advances towards the steam engine, the length of main under exhaustion and exposed to leakage is constantly diminishing, and thus the average length, so exposed, is reduced to one-half. The surplus power necessary for leakage may therefore be reduced to this extent, and it thus becomes 4·43 HP, to which is added ·57 per mile (or 1·71 HP for a section of three miles) for the constant leakage of the pump valves and travelling piston, and for other contingencies: making the total power necessary for pumping out leakage, 5 HP per mile, or 15 HP per section of three miles.

Another peculiarity of the system consists in its working on such inclines as are usually called bad gradients. So long as the steepness of the inclines is not too great for the trains to descend without using the break, no power is lost, and the cost of working is no greater than on a dead level; for the whole of the additional power, required to overcome gravity, while ascending the incline, is restored in descending it, and when the inclined planes occur of great length, and of such an acclivity as can be descended without check from the break, or aid from the exhaustion of the main, there is even a slight saving in the cost of working them, as compared with a level; for as, in such a case, the power of the steam engines is transmitted by vacuum in one direction only, whatever losses occur by leakage, &c., are felt in one direction only, and will, consequently, exist but for half of the time and distance traversed.

It is true that, in this case, the power employed must be increased in the same proportion as the time is diminished; but we find by experience, that the losses in the transmission are not increased in the same proportion, and that the loss by leakage is not at all augmented.

These two peculiarities of the atmospheric system compare very favorably with the present system, in which additional speed, or bad gradients, materially increase the cost of working.

There is another peculiarity exclusively belonging to the atmospheric system, which, although self-evident, is of such importance that it should not be omitted—that is, the safety from collision. It will be at once perceived, that it is impossible for one train to overtake another, for the piston of the first forms an unapproachable barrier to the next; as no vacuum can be made to operate upon the latter, until the former is out of the pipe, and consequently three miles away from it; and as the engines operate only on one section at a time, two trains can never meet, except at stations expressly provided for that purpose. This is of importance, not only as regards the safety it affords, and the confidence it will give, when travelling at high velocities, but also, as it removes the only obstacle to the construction of single lines of railway. By these means, single lines of railway may be traversed with greater security than double ones now are; and there are very few long railways which have more traffic passing over them than could be done on a single line, if the public safety permitted it.

The next point treated is the cost of working, and the author is fully aware, that on this head it is more difficult to convince than on any other. The following detail is given, in order to show that many items of very heavy expense, which are indispensable on the present system of locomotion, are avoided on the atmospheric system. The weight of the locomotive engine is of course dispensed with, and, in quick trains, this forms no inconsiderable portion of the weight to be moved. Coal is substituted for the more costly fuel—coke, and, besides the saving in value from this substitution, its quantity is reduced, by the facility afforded by stationary power of introducing all the means of obtaining the best effect from the fuel consumed: condensation, expansion, and a more perfect absorption by the boilers of all the heat generated by combustion, are among these advantages. The destructive effects to the rails, by the weight of the locomotive engine, and the friction of its wheels upon them, as fulcra to propel the trains, are also avoided; and the difference between the wear and tear of locomotive and stationary engines, must always be considered. From the experience acquired at Dalkey, of the very small additional expense incurred on the valve, travelling apparatus, and such parts as are peculiar to the atmospheric system, the following conclusions have been arrived at, as to the comparative cost of working, on the atmospheric and the locomotive systems.

On a line similar to the London and Birmingham Railway, viz., one hundred and twelve miles in length, the cost of working, at present, with locomotives, is about—

	Per train per mile.
For Haulage	15*d.*
Maintenance	8¾

With the atmospheric apparatus it would be—

For Haulage	$5\frac{55}{100}d.$
Maintenance	$5\frac{38}{100}$

And on the atmospheric system, there would be the additional advantage of travelling at a mean velocity of fifty miles per hour, instead of twenty or twenty-five miles, as at present.

The experience already obtained between Kingstown and Dalkey, enables the author to speak with certainty on this head; and the regularity of the trains, and the general satisfaction which the working affords, are, he contends, good practical proofs of the efficiency of the system.

The communication is accompanied by six drawings, showing a section of the Dalkey line, also plans and sections of the apparatus, as constructed by Messrs. Clegg and Samuda, and by Medhurst.

Mr. Newton inquired, wherein consisted the novel features of the system of propulsion, which had been described.

Mr. Samuda replied, that one important feature in the atmospheric railway, as described by him, was the success which had been obtained; the most appreciable novelty was the continuous valve, which, in its construction, differed from all the previous attempts to close the aperture, through which the connection was made between the piston and the carriage. The mode of closing that aperture had been the stumbling-block, in all the preceding inventions, as with none had it been found practicable to effect that object sufficiently to form any useful degree of vacuum.

Mr. Newton thought, that members should be in possession of the schemes which had preceded the present system of atmospheric railway, He then, after stating that he believed a plan for conveying mail bags by propulsion, through a tube, to have been first suggested in the United States of America, explained the plans of Medhurst, Vallance, and Pinkus, for conveying passengers and goods.

Medhurst's first idea (in 1810 and 1812*) was to use condensed air, which being allowed to escape from a chamber into the main, should propel the piston before it. His next plan, in 1827, was to act, by exhausting the main, the continuous opening on the underside, being guarded by a flanch on either side of it, immersed in water, thus forming a valve, which permitted the connexion to be made between the carriage and the piston.

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* Vide 'Calculations and Remarks, tending to prove the Practicability, Effects, and Advantages of a plan for the rapid conveyance of Goods and Passengers upon an Iron Road, through a tube of 30 feet in area, by the power and velocity of Air,' by G. Medhurst.—Tract, London, 1812. Also, 'A new System of Inland Conveyance for Goods and Passengers, capable of being applied and extended throughout the Country; and of conveying all kinds of Goods, Cattle, and Passengers, with the velocity of Sixty Miles in an Hour, at an expense that will not exceed the one-fourth part of the present mode of travelling, without the aid of Horses or any animal power,' by G. Medhurst.—8vo. Tract, London, 1827.

Vallance's plan (in 1827*) was to have a series of cylinders, of large diameter, within which the carriages containing the passengers and goods should travel, being propelled by the pressure of the air upon a disc, which formed the front of the leading carriage, the cylinders being exhausted by air pumps.

Pinkus' plan in 1834† (of which Mr. Newton presented a drawing), was an extended cylinder, or main, of about 40 inches diameter, with a longitudinal opening along the upper side, through which an arm extended from the piston to the leading carriage, which, with the rest of the train, ran upon rails on the outside of the main. The aperture in the cylinders, before the piston, was closed air-tight, by a flexible cord, which was raised by a grooved wheel in the centre of the carriage, and pressed down by two other wheels at either end, as the train travelled forward. A partial vacuum was created in front of the piston by air-pumps; the atmosphere was supposed to rush into the cylinder, through the aperture which was laid open by the raising of the valvular cord, and impinging on the plenum side of the piston, would produce a pressure proportional to the degree of rarefaction on the opposite side.

This plan was tried on a small scale, and was found to act well, but much difficulty was anticipated in the hermetical closing of the valvular cord, and Mr. Newton conceived that a similar objection existed to the valve of Messrs. Clegg and Samuda's plan.

Mr. Samuda said, that he, like many other members, was aware of the nature of the previous inventions for impelling carriages by pneumatic pressure, and he would not occupy the time of the meeting by discussing bygone schemes.

In the atmospheric railway, as now constructed, there were necessarily many practical improvements, which were consequent upon the experience acquired during the experiments at Wormwood Scrubs, and on the Dalkey line; but, as he had before stated, the chief improvement was in the continuous valve. That valve was composed of a strip of ox-hide, strengthened above and below by iron plates, the lower one falling within the groove, and the upper one being sufficiently wide to cover it. The valve was fastened by one edge of the leather, and when down it fitted closely over the aperture, the groove at its edge being covered with a composition of wax and tallow, in such proportions as had been found to remain sufficiently soft to form a close joint in all seasons, without melting in hot weather, or becoming too hard during frost.

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* Vide 'London Journal of Arts,' Conjoined Series, vol. vi., p. 158.

† 'London Journal of Arts and Sciences,' 1st Series, vol. x., page 113.

By means of that description of valve, a vacuum of 25 inches of mercury had been obtained in a pipe 1¾ mile long; whereas it was generally understood, that with the valvular cord, Mr. Pinkus had not succeeded in procuring a vacuum of more than 2 inches of mercury in a pipe about 12 yards long.

[*To be continued.*]

NATURAL POLARISCOPE.

In the mica quarries at Grafton, New Hampshire, where this mineral is obtained in large quantities for stove fronts and other economical purposes, black tourmalines are frequently found compressed between the laminæ of mica. In looking over a large quanty of this mica, Mr. Silliman found several specimens where the tourmalines were so thin as to be transparent, and of a fine clove-brown color, although the crystals are ordinarily quite black. The thought at once suggested itself that we were here provided by nature with the means of polarization, and no time was lost in constructing, of two thin tourmalines, and a piece of the binaxial mica in which they are imbedded, a very good instrument. It will be observed that the compression of the tourmalines has taken place in a plane perfectly parallel to the vertical axis of the prism, and consequently in the right direction to ensure the maximum effect. It is feared that the color of the tourmalines will be found too dark to allow of their general use, as they must be made very thin in order to admit light enough to pass. But the fact is an interesting one, that nature should have anticipated the construction of one of the most refined of modern optical instruments.—[*Silliman's Journ.*]

CHLORAZOTIC ACID.—BY M. BAUDRIMONT.

The property that aqua regia has of dissolving gold and platinum, and which has been supposed to be due to the presence of chlorine, is shown to be owing to a peculiar acid, having for its composition $Az\,\overline{O^3Ch^2}$. It can be obtained by mixing together two parts of nitric and three parts of hydrochloric acids of commerce, when it escapes in the form of red fumes, mixed at first with the vapor of a little hydrochloric acid; it can be condensed in a U tube, placed in salt and ice, and then appears as a liquid of a deep red color; in this state it attacks all metals, when brought in contact with them; with finely divided silver it explodes immediately. In acting on metals it forms a chloride and a nitrate. Its action on metallic oxides indicates that it is an acid of a definite character, being represented by nitric acid, with two atoms of oxygen substituted by two atoms of chlorine.—[*Journ. de Pharm. et de Chim.*]

THE OXIDES OF GOLD, AND PURPLE OF CASSIUS.—BY L. FIGUIER.

The green powder described by chemists as the protoxide of gold is found to be a mixture of metallic gold with the oxide. This latter, instead of having the extreme instability ordinarily allotted to it, is found to be the most unalterable of all the oxides of this metal. It is a violet powder so dark as to appear black when in a hydrated state. It is an indifferent compound, combining with both bases and acids. The hydracids produce a deposit of gold, dissolving a tritoxide that is formed. With ammonia it forms a violet fulminating compound; at 250° C. (482° Fah.) it is decomposed. The protoxide can be procured in various ways, by treating the neutral trichloride of gold with the protonitrate of mercury; by acting upon the tritoxide of gold with acetic or almost any of the organic acids, or with the salts of their acids, vegetable or animal matter produces the same effect. Figuier thinks that he has discovered a compound of gold and oxygen containing more oxygen than any of its oxides previously known—it is called *perauric acid.* Its composition has not yet been made out; it is formed under the following circumstances: when the tritoxide of gold is boiled with caustic potash, there is formed an abundant precipitate of the protoxide of gold, without any escape of oxygen, which must therefore combine with a portion of the tritoxide, forming a compound more highly oxygenated, that remains dissolved in the potash. *The purple of Cassius,* when pure, is shown to be a neutral stannate of the protoxide of gold; without regard to the manner in which it may be formed, its formula is $3(St\,O^2)\,Au^2\,O+4HO$. The stannic acid has been shown by Fremy to require three equivalents for the formation of the neutral stannates. There is also a bistannate of the protoxide, $6(St\,O^2)\,Au\,O+4HO$.—[*Compt. Rend.*]

SACCHARIC ACID.—BY M. HEINTZ.

He has succeeded in preparing this acid, without any difficulty, in a state of purity, by treating 1 part of sugar with 3 parts of nitric acid of 1·25 sp. gr. and not heating it higher than 122° F.

By attending closely to the temperature, no trace of oxalic acid is formed. After the reaction is completed, the mixture is saturated with carbonate of potash, then acetic acid is added until the mass smells of it, when the slightly soluble bisaccharate of potash is left undissolved, and if dried between blotting paper, and recrystallized, it can be obtained perfectly pure; from this the saccharate of cadmium is formed, and decomposed by hydrosulphuric acid to furnish the saccharic acid, (the lead salt will not answer for this purpose.) The acid can be obtained as a brittle mass, by evaporation and desiccation in a vacuum with sulphuric acid.—[*Beric Königl. Preuss. Akad.*]

SULPHACETIC ACID.—BY M. MELSENS.

This acid is formed by the action of sulphuric acid upon acetic acid. The best mode of forming it is as follows:—Add together anhydrous sulphuric and acetic acids, and assist the reaction by heat; saturate with carbonate of baryta; decompose the crude salt with sulphuric acid; filter; saturate with oxide of silver, when the sulphacetate of silver will crystallize out. The acid can now be obtained by decomposing this salt with sulphuretted hydrogen. The acid can be procured in the form of crystals, which are very deliquescent; heated to 160° C. (320° F.) it gives the characteristic smell of caramel or burnt tartaric acid, when it becomes brown; at 200° C. (392° F.) its decomposition is complete. The following formula represents the composition of the acid:—$C^8 (H^2, SO^2) O^3, SO^3, 2HO+2\ Aq.$ It combines with bases, 2HO being replaced by two atoms of the base.—[*Ann. de Chim. et de Phys.*]

ANTIRRHINIC ACID.

M. Morin gives this name to a soluble acid, procured, like the digitalic acid, from foxglove. It is obtained by distilling the leaves of the plant with a large quantity of water, as long as the product has any odour and reddens litmus paper.

The distilled liquor is to be saturated with a slight excess of caustic barytes, and then to be evaporated to dryness by the water-bath; a product is obtained which resembles benzoin; this is to be mixed with an equal volume of oxalic acid, and distilled in a glass retort by a water-bath; the product has a strong smell; water is to be added to the retort, and distillation is to be repeated as long as the product possesses a strong smell.

The distilled liquors are to be rectified with chloride of calcium by the water-bath; the first product is a saturated aqueous solution, on the surface of which float oily drops of pure acid.

The quantity of product obtained is very small; and the fresh plant yields more than the dry.

The properties of the antirrhinic acid thus obtained are, that it is soluble, has an oily appearance, colorless, and reddens litmus paper strongly; it dissolves in alcohol, and in contact with water it is converted into white pellicles, which are probably a hydrate, and it eventually dissolves; its taste is disagreeable, and its smell resembles that of bruised fresh digitalis; when the dry plant is employed, the acid is found in the first product of the distillation; the concentrated solution readily occasions head-ache, and may even produce giddiness. The author observes that this acid strongly resembles valerianic acid, and may possibly be identical with it.—[*Phil. Mag. June,* 1845.]

ON PLUMBIC ACID AND PLUMBATES.

M. Fremy remarks, that as the experiments which he has performed on the peroxide of lead prove that this substance, which has hitherto been considered as a neutral or indifferent oxide, combines with alkalies, and forms true salts, he has given it the name of plumbic acid; and, in order to prove that it is such, he endeavoured to prepare crystallized compounds of it and the alkalies.

Plumbate of Potash.—In the opinion of M. Fremy the production of this salt leaves no doubt as to the acid properties of the peroxide of lead. It is impossible to form plumbate of potash by heating plumbic acid in a dilute solution of potash, for this salt is stable only in a very alkaline solution; in order to produce it, a mixture must be made of plumbic acid with potash dissolved in a very small quantity of water; this is to be put into a silver crucible, and boiled for some time; the plumbic acid disappears by combining with the potash. If then the mass be treated with a small quantity of water, and it be submitted to slow evaporation, it yields fine transparent crystals of plumbate of potash.

This salt is white, and crystallizes in rhomboids; it is very deliquescent, and dissolves, without decomposition, in alkaline water; but in pure water it forms a brown solution, which contains biplumbate of potash, and afterwards deposits hydrated plumbic acid. When exposed to a high temperature, it is decomposed, losing water, and afterwards oxygen.

This salt yielded by analysis,—

Plumbic acid	60·7
Potash	24·9
Water	14·4
	100·

Representing the salt by $PbO^2, KO, 3HO$, its composition will be,—

Plumbic acid	60·0
Potash	25·3
Water	14·7
	100·

If this salt be considered as a neutral plumbate, it will be seen that in plumbates the oxygen of the acid is to that of the base as 2 to 1.

Plumbate of Soda.—This is prepared in the same way as the potash salt; it is less soluble in water, and when treated with water, it becomes at first yellow, and then quickly quite brown.—[*Ibid.*]

NEW METHOD OF PREPARING A PHOTOGENIC PAPER.

BY M. GAUDIN.

A SHEET of white paper is to be exposed for a minute to the vapor of chlorohydric acid, after which a nearly saturated neutral solution of nitrate of silver is to be passed over its surface by means of a brush (which must not be fastened with metal): the paper is then allowed to dry. The dry sheet is then placed in the focus of a camera obscura; on being removed no traces of the image will be visible, but upon wetting the paper with a nearly saturated solution of sulphate of iron, slightly acidified with sulphuric acid, the image will appear immediately.

In order to fix the image, it must be well washed, first with pure water, and afterwards with water containing 10 per cent. of caustic ammonia. If the parts which ought to be white have a yellow tinge, the paper must, before being allowed to dry, be washed in water acidified with chlorohydric acid.

The proofs thus obtained are reversed, as is the case with Mr. Talbot's paper; the sensitiveness of this paper is also similar to his.

In order to reproduce the reversed images, thus obtained, in their true position, the same paper must be used without passing it through the sulphate of iron, and the operation must be continued until the edges of the paper surrounding the reversed image have become black.

If ammoniacal salts of silver are employed instead of the ordinary nitrate of silver, a more sensitive paper is produced; but the solution is more volatile. Nevertheless, for the production of reversed images, M. Gaudin uses a paper prepared by passing ammoniacal acetate of silver over paper impregnated with chlorohydric gas.

Excellent nitrate of silver may be produced with a piece of money.

The inventor exposed a reversed image to the sun for two days, without its undergoing any change.

In order to reproduce the reversed images, they must be varnished, which removes the inequalites from the paper, and materially assists the operation.

The paper must be prepared by the light of a taper; but after passing the sulphate of iron over it, the operation may be concluded by daylight.—[*Bulletin de la Societé d'Encouragement.*]

Scientific Adjudication.

COURT OF EXCHEQUER, WESTMINSTER.

Before the Chief Baron Sir F. Pollock, and a Special Jury,—
23rd & 24th June, 1845.

BUNNETT *v.* SMITH.

THIS was an isssue tried by order of the Court of Chancery, to ascertain the fact of an alleged infringement of the plaintiff's patent; the Court having refused to grant an injunction to restrain the defendant from making certain metallic window shutters until the infringement had been proved before a jury.

Mr. Hill and Mr. Jervis, appeared for the plaintiff. Mr. Knowles, Mr. Martin, and Mr. Hindmarsh, for the defendant.

Mr. Hill opened the case, by stating that the plaintiff, in June, 1836, obtained a patent under the Great Seal, for his invention of "certain improvements in window-shutters, which improvements might also be applied to other useful purposes"*; and that he duly inrolled a specification of the same, with drawings, exhibiting his invention, the particular features of which were the construction of metallic shutters, formed by a series of laths or strips of iron, connected together by peculiar hinges, and made to roll or fold upon a revolving shaft or roller: the external appearance of these shutters, when extended, being nearly the same as Venetian blinds. The plaintiff did not claim to be the first inventor of shutters of such character and appearance, but of certain particular improvements in their structure, for which his patent had been granted, and which improvements he accused the defendant of having been guilty of imitating. The novel features of these shutters consisted in the three following matters:—the adaptation of a particular kind of hinge to such shutters; the mode of raising and lowering them; and a peculiar mode of fastening the shutters when extended, so as to prevent their being opened.

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* For description of this invention see Vol. IX. of our present Series, p. 275.

The first of these improvements was a hinge, so formed at the joints, that no part of the laths or strips of metal need be cut away, to admit the knuckle of the hinge; secondly, an endless screw, or worm-shaft, taking into a pinion, was employed for raising and lowering the shutter; and thirdly, there was a bolt, of a novel construction, to fasten them. This third feature, the bolt, did not appear to have been used by the defendant—therefore he should altogether dismiss it from consideration—nor did the second, the worm and pinion, form any part of the alleged infringement; but that would be considered in the course of the trial, as the defendant made that an objection to the validity of the plaintiff's patent, upon a plea that it was not new.

To the first part of the patent only, he, Mr. Hill, should therefore particularly direct the attention of the jury; that is, the construction of the hinges, and mode of attaching them to the laths or strips of metal; and he trusted that he should convince them, that though, previously to the plaintiff's patent, shutters had been made by connecting a series of laths or strips of iron, by means of hinges, so as to render them capable of winding or lapping upon a rotary shaft, yet none had been made prior to the date of the plaintiff's patent, possessing those particular features and advantages which he claimed to be the invention and sole property of the plaintiff; and these he should show had been colorably and evasively imitated by the defendant, and for which he now asked for a verdict and damages at their hands.

Mr. Jervis then called Mr. W. Carpmael, who stated that he knew of the existence of iron shutters before 1836, the date of plaintiff's patent; that they were made of iron strips, notched on the edge, to admit the knuckles of the hinges by which the several strips were connected together to form the winding shutter or blind; that the strips were so connected, that their lower edges slightly over-lapped like weather-boards, and that they rolled up or lapped upon a roller. These were made by Barrow and Turner, but were not the subject of any patent;—considered those shutters to be, at the joints, open to the weather, and capable of having the joint-pins readily knocked out by burglars on the outside;—has examined Bunnett's improved shutters, and thinks them new, and a very great improvement in construction and cost; and also more safe and elegant. The mode of raising the improved shutters was new and useful.

On being cross-examined by Mr. Knowles, this witness said, that the defendant's metal strips, or series of laths, were connected together by peculiar flat chains, the links of which have double axles; that the mode of raising the shutters by the plaintiff was by a very common mechanical contrivance; it was only new as applied to shutters of this class. Witness was shown the specification of a patent granted to George Michael, in May, 1818, for his invention of "certain improvements in the method of opening and shutting windows and sashes; and also in the application of machinery to the opening and shutting of window-shutters, and in other cases where the aforesaid improvements may be applied." In this plan, the lath shutters moved sideways, and were wound round a vertical shaft, by the agency of an endless screw, taking into a toothed wheel upon the winding-shaft; and there was a coiled chain, for drawing out or expanding the shutters laterally; whereas, in the plaintiff's, they descended by their own weight. The worm-shaft of plaintiff's, by its oblique thread, was capable of preventing the shutter from running down: did not know that plaintiff had subsequently found it necessary to apply a ratchet and click to hold the shutter at any required elevation, and prevent its rapid descent; believed he had found such necessary when the shutters were very heavy.

Mr. J. Farey stated his opinion to correspond with that of Mr. Carpmael. On being cross-examined, was shewn two models of shutters, made by Barrow and Turner, before the date of plaintiff's patent, and, on inspecting them, he said he did not consider Barrow and Turner's shutters like those of the plaintiff's; because, in reference to the first model, the knuckles of the hinges were let into a notch in the edge of the rail, but there were no such notches in plaintiff's. Saw also another material difference in the hinges;—in those of the plaintiff, the joints were formed by three loops, having a pin or axle through them; two of the loops being on the upper side of the hinges, and one on the lower; whereas, in Barrow and Turner's hinges, only one loop was on the upper and the two loops on the lower side; considered that the shutters were weakened by cutting away the notches in the edge, for the knuckles of the hinges; also that they were more expensive to make, from the necessary labour of cutting such notches; and that the joints of the hinges might be more easily cut or broken from the outside. Mr. F. thought, that in the second model of Barrow and Turner's, the laths would overlap if they were made something wider (no notches were, in this instance, cut in the laths), but they were more open at the joints, and liable to rust from the weather.

Mr. G. Cottam knew iron shutters, resembling Venetian blinds, first when they were put up, some years ago, at the Duke of

Wellington's house, in Piccadilly, after his windows had been broken by a mob. These blinds were formed by strips of iron, connected by a stout canvass behind. They were made by the late Mr. T. Bramah, and were not designed for strength, but merely to prevent stones from breaking the windows. This witness enlarged upon the cost of cutting the notches in the laths, as considerably increasing the expense of constructing such shutters, which expense was avoided by the improvement of the plaintiff in dispensing with the notches. On being shown the second model of Barrow and Turner's shutters, he could perceive a great difference and inferiority between it and the plaintiff's. It certainly had no notches cut in the laths, but the laths did not overlap, or if they did, the overlapping was scarcely perceptible; and shutters so made would not keep out the weather; besides, the loops of the knuckles of the hinges were not the same, but reversed. Under cross-examination, by Mr. Martin, the witness persisted on the expensive work of cutting away the notches; and, being asked if that could not be readily done by ordinary punching machinery, observed, there was the cost of that machinery to be considered,—its wear and tear, rent of premises, time of workmen, and waste of materials.

Manby, a workman, was then examined. He made the first shutters for plaintiff; since their introduction, the demand had been very extensive, and was increasing; had seen the shutters put up by the defendant, at the banking house of Messrs. Smith, Payne, and Smiths, near the Mansion House, in the City, and was of opinion that they were an infringement of the plaintiff's patent.

The case for the plaintiff being closed, Mr. Martin, for the defendant, in the absence of Mr. Knowles, expatiated upon trivial alterations being magnified into improvement, and dignified with the title of patents, under the Great Seal of the realm. He was far from intending to condemn the protection which the law very properly gave, under a patent, to new inventions. He considered every man was as justly entitled to the advantages resulting from the exercise of his genius, as to that of the products of his mechanical labours; but if every trifling change of form or position, producing no visible advantages over its precursor,—if every whimsical alteration of parts, destitute of novelty of character or utility of purpose, were to be protected by the patent laws, such protection would operate as a most vexatious bar, in many instances, to the introduction of really useful and valuable inventions. In the year 1818, a patent was granted to Mr. John Whiting, of Ipswich, for an improved window shutter, the specification of which he was about to produce to the Court. These shutters were made of a series of connected strips forming a sheet, when expanded, to cover the window, and winding round an axle when the window was to be opened. Here, then, was the early introduction of this class of lath shutters. Shortly afterwards, another patent, which had already been mentioned by some of the witnesses, was taken by Mr. George Michael, of St. Austell, in which also shutters, formed by laths wound or lapped round a shaft, constituted a prominent feature. There was also a mode of winding up such shutters by a tangent screw, or endless worm, as it was called, taking into a pinion attached to the winding shaft, by means of which the series of jointed pieces or laths were coiled up. Some years after this, lath blinds or shutters were made for the Duke of Wellington, at Apsley House, as some of the witnesses have said, in order to protect the windows of his Grace from the mischievous caprice of the lawless populace. This occurrence appears to have given impulse to the extensive introduction of this class of shutters, for we find that in or about the year 1833, Messrs. Barrow and Turner, large manufacturers of iron furniture, near Oxford Street, took up the subject, and, availing themselves of what was already before the public, added by their own ingenuity (and without attempting to obtain a patent,) such contrivances as enabled them to manufacture the two constructions of lath shutters shewn by the models now produced before the Court. These models, it will be proved, have been publicly shown in the shop and counting-house of those gentlemen, as specimens of the kind of shutters which they were ready to make for any customer who would favor them with an order. It will be proved that they did make both these kinds of shutters for several parties, and that those constructions, therefore, were not kept secret, but were unquestionably made public property, and not attempted to be claimed as exclusively belonging to Messrs. Barrow and Turner. In one of these specimens, a small portion on the edge of each lath, strip, or plate of iron, was cut away, to let in the knuckles of the hinges; in the other, the lath was not cut away, and, indeed, possessed every characteristic of the plaintiff's first suggested improvement.

Now, Whiting's shutters being formed by strips of metal or wood, connected by hinges, and made to wind upon a horizontal roller, either at the top or bottom of the window, was a new contrivance, at the time of its introduction, and, beyond all doubt, if the plaintiff had introduced his alleged improvement, before Whiting's patent right had expired, he would have been guilty of an infringement upon Whiting. In Michael's patent there is the mode of winding or lapping up the shutters by means of an endless screw and pinion. On this, the plaintiff would also have infringed, if the patent right had not expired. Barrow and Turner made and sold the shutters, of which you see models, prior to the year 1836, the date of the plaintiff's patent, and yet, with all this, the plaintiff has the assurance to come before you to assert that the shutters of the defendant, which are much less like his than his shutters are like those which preceded him are a colorable and evasive piracy upon his invention and patent right.

The learned counsel then apologized for the length of time which he had occupied in laying the defendant's case before the jury, but felt great confidence, that when he should produce the evidence of the facts which he had mentioned, they would feel that he was justly entitled to their verdict.

Mr. Turner was then called, who stated that he was a manufacturer of iron shutters; that the two models produced were made in his establishment in 1833 (he being at that time in partnership with Mr. Barrow); that these models had always been publicly shown to his customers; and that he had made many shutters, according to both models, and fitted them on a variety of plans, some at Lord Brownlow's, in 1833, at the Turk's Head, in the Strand, 1834, and subsequently at several banking houses, club houses, railway stations, and other places. He stated, that the second model, in which there were no notches in the laths, was made of narrow laths, to save room, as wider laths would not have folded up in the space allowed to receive them; and Lord Brownlow desired them not to overlap, because he wished to be able to look through the shutters down into the street. Others, that he had made subsequently, had overlapped; there was no difficulty in making them overlap; could see no difference between his own and the plaintiff's—no substantial difference: cutting the notches in the edges of the metal laths did not cost more than one penny for every twenty laths; all machinists had presses which would perform such work. Witness examined defendant's mode of connecting his laths, to form shutters, by double-jointed chains, instead of hinges; thought the mode very good, and preferable to plaintiff's, because the laths would lay closer to the roller, and allow of the shutters rolling up in a smaller compass. Admitted that the plaintiff had talked of bringing an action against him twelve months ago, for putting up some shutters, but had not done so.

William Brooks, a workman, stated that he had made the models and shutters for Messrs. Barrow and Turner, in 1833, and that they were the same now produced.

Mr. W. Hill, an engineer, and inspector of railroad machinery, stated, that he had seen the shutters, manufactured upon Michael's principle, at Falmouth, twenty-five years ago; they were erected at a linendraper's shop, and were wound round a vertical shaft, by a winch; he had not seen the internal construction of the winding apparatus; but, as the main features, exposed to view, were the same as those described in Michael's specification, he presumed that the endless screw and pinion was used for that purpose, as pointed out; that was, however, a very common and well known mechanical agent, employed for raising heavy weights. This witness said also, that he had, several years ago, seen the same construction of shutters at a shop in Broad-street, Bristol, both of which he considered to be made after the plan of Michael's patent.

A gentleman, an architect, was called, who said that he knew all the various kinds of iron shutters that were used, and, after examining the models and plans, could see no essential, if any, difference between the shutters made by Messrs. Barrow and Turner, and those of the plaintiff. There was more difference between the defendant's and plaintiff's, than between the plaintiff's and the other models shown.

Mr. W. Newton being called, was shown a copy of the specification of Michael's patent of 1818, for improved shutters, and, being asked if he understood, from the description, how his shutters were constructed, the witness remarked, that the specification was very carelessly and imperfectly drawn, but could perceive enough to enable him to understand what was intended. The shutters were made by a series of vertical laths, connected together, and made to slide horizontally, so as to form a sheet for covering the aperture of a window. They were intended to lap round an upright pillar, at the side of the window; and the lapping was effected by turning an endless screw shaft, which geared into a toothed wheel. Either the shutters were attached to the upright shaft, and wound upon it, as the shaft revolved; or they wound upon a cylindrical tube, connected to the toothed wheel, the tube turning upon a stationary shaft. Both of these modes appeared to this witness to be contemplated by the patentee; but he had shown such an imperfect drawing, and made use of such incorrect expressions, that it was difficult to discover what he really intended. The shaft was said to be 'fixed,' when, perhaps, it should have been 'mounted.' That which was called a 'spiral shaft,' appeared to be only a shaft on which the shutters were to be coiled in a convolute curve, by some persons called a spiral. The plan, however, seemed to be understood, for the plaintiff himself was at the present time constructing shutters for the shop of Messrs. Moses and Son, near Aldgate, upon the principle of Michael's patent. The witness, on being desired to look at the models of Messrs. Barrow and Turner's shutters, and compare them with the plaintiff's, said that he could not point out any essential difference between them, or discover any peculiar or novel principle in the plaintiff's shutters. The shutters of the plaintiff were made by combining a series of narrow slips of plate iron, by means of hinges. Barrow and Turner's shutters were made in the same way. The peculiar hinges by which every two laths were connected together, were made by doubling over the ends of a piece of plate iron or copper, something in the shape of a figure of 8, elongated in the middle, so that at each end a loop might be formed, to constitute the knuckle joints of two hinges; these loops were bent over, one end in one direction, the other in the opposite direction, something like the ends of an italic letter *s*; and when the knuckles were cut or notched square, as other hinges, to fit accurately into each other, two pieces were put together, and connected by a pin, which constituted the joint. The laths of the shutters being severally attached to the flat faces of these hinge pieces, all on the same side, would necessarily lay in steps, that is, the outer edge of one lath would project or overhang the inner edge of the next lath, and so range themselves in inclined planes, that they would severally protect each other, and throw off the weather. Much confusion and misconception had occurred by the several witnesses for the plaintiff having stated that there were essential differences between the construction of the hinges of Barrow and Turner's shutters and those of the plaintiff. This deponent could see no difference: it was perfectly immaterial, in attaching these hinges, whether the two loops or the one loop of the knuckle of the hinges stood in the upper or lower position.—[The Chief Baron said, certainly that could not produce the slightest difference.]

The witness, under cross-examination, having his particular attention called to the second model of Barrow and Turner's shutter, said that the outer edges of the laths did slightly overlap; but the model was so indifferently made, that some of the laths did, and some did not, overlap. In the model of the plaintiff's shutters, which was well made, the edges of the laths did all overlap; this he considered to arise simply from the laths being made a little broader. On being questioned as to Barrow and Turner's first model, he said, notches were cut in the edges of the laths, to admit the knuckles of the hinges, and that the edges did overlap. In the second model, no such notches were cut; but he could discover no variation, in principle, between them. The only difference was that, in the one, the upper knuckle of the hinge was let into the upper edge of the lath (not for any useful purpose, that he could perceive); in the other model of Barrow and Turner's, the upper knuckle was placed a little beyond the upper edge of the lath, which was the novel feature claimed by the plaintiff.

The defence being closed, Mr. Hill replied at considerable length, commenting upon the evidence, and the objection raised against the plaintiff's patent, and concluded with a belief that he had satisfactorily proved the infringement, and therefore trusted that the jury would give the plaintiff their verdict.

The Chief Baron, in summing up, said, that he did not think it necessary to enter into a consideration of all the objections placed upon the record by the defendant, nor should he recapitulate the whole of the evidence, in which, though coming from persons of acknowledged talent and respectability, and who also were constantly referred to as scientific witnesses in patent causes, there certainly was considerable discrepancy,—the one side asserting that there were differences of construction, which the other denied:—the Chief Baron must say, that from what he had heard this morning, his opinion was considerably changed from that which he had formed yesterday; the matters, however, had at length been so clearly explained, and could now be so evidently seen, that he left it to the jury to decide the fact, whether the shutters of

Barrow and Turner were, or were not, essentially the same as those of the plaintiff. His lordship then recited the three heads of novelty which the plaintiff had set out as the particular matters that he had invented, and intended to claim under his patent, which are in these words :—" First,—I claim the application of such construction of hinges, in combination with the absence of cutting away the edges of the plates or strips. Secondly,—I claim, for raising the shutter, the application of the endless screw and toothed wheel to this description of shutters. And Thirdly,—the construction and mode of releasing the bolt by means of a key or winch."

The third head was not said to have been infringed, and did not appear to have been used by the plaintiff to any extent; but presuming it to be new and useful, the non-usage did not effect the validity of the patent. The second head,—the mode of raising and lowering the shutters by means of an endless screw or worm, is said to be old, and if so, destructive of the patent. That the jury would have to determine by comparing it with Michael's patent of 1818. The main feature to be considered came under the first claim; but his lordship preferred, before going into that, to dispose of the second claim. Michael's shutters moved horizontally,—but there certainly is in that patent an endless screw and toothed wheel for moving the shutters, for winding them in and out. But Michael does not resort to it as a means for supporting his shutters as the plaintiff does; but the plaintiff only claims the endless screw and pinion as adapted to such, that is, his particular shutters. There can be no doubt that the endless screw is employed by Michael; and if the jury are of opinion that the endless screw was taken from Michael's or from Whiting's patent, then the plaintiff's patent is bad, and the verdict must be for the defendant. But his lordship said, I must tell you that the bad part may be expunged from the patent, by an application to the Attorney-General, so as to reinstate this patent, and make it valid, though not for the purposes of the present action.

Now, in considering the plaintiff's first claim, it is to be remembered, that rolling-up shutters were made in 1825, of strips of iron, connected together by canvass at the back, which were set up at the house of the Duke of Wellington; and probably this caused the extensive subsequent adoption of such shutters. After this, Messrs. Barrow and Turner made those which have been shewn here; and it has been sworn that the plaintiff went to the shop of Barrow and Turner, under the pretence of being a purchaser, and saw their shutters about the time he took his patent, certainly before he enrolled his specification. It is for you, the jury, to consider whether the plaintiff went there to obtain information, and availed himself of what he there saw, to incorporate it into his patent, or to see what had been done, and avoid claiming any thing which had previously been in use.

In explaining the law as to patents, the Chief Baron said,—if a patent is taken for an invention, a second patentee cannot ride over the first invention, by any improvements which he may introduce. As in the case of Forsyth *v.* Manton, the latter could only use his copper caps for discharging fire-arms under license of the former patentee (who had a patent for discharging fire-arms by means of percussion), or wait until the first patent right had expired, before he could legally introduce his improvement. Neither can a patentee claim, under any improvement, the exclusive use of those matters which have been known before. Hence, the present plaintiff must limit his claim solely to that which he has invented and added to the known previously-existing mode or construction. A patent cannot be taken for a principle; it must be for some specific construction. A patent for the general principle of overlapping laths would not hold; but for a mode of doing it, he may hold a patent. No one could have a patent for flying; but for his particular means of flying, he could. A patent cannot be held for an improved result: only for improved means of obtaining a result. The plaintiff must not say, I make my laths to overlap, and no one else shall make laths overlap.

The case in point is, that Barrow and Turner, in 1833, made two kinds of shutters, A and B, and put up some, as A, which overlapped at their edges, but these had notches or recesses cut in the laths; B had no notches cut in the edges of its laths, but did not overlap, or very little. The plaintiff, it is said, went to Barrow and Turner, and saw their invention: for what purpose does not appear. The scientific witnesses, on both sides, are opposed in their opinions, as to the identity of Barrow and Turner's and the plaintiff's shutters,—of the hinges and the lapping over of the laths,—you have to judge of that fact. By cross-examination of the last witness, it was proved that the one or the two knuckles of the hinges, up or down, was the same in effect, and the only difference was putting the joints of the hinges a little farther from the edge of the lath in the one than in the other. The fact of identity being proved, the question still would be, did the plaintiff see Barrow and Turner's shutters made according to B, and were they published to the world; for, if like the well-known case of Dollond's telescope, the invention previously existed, but had been locked up in the philosopher's study, that would not invalidate the patent, for it was not proved that Dollond had seen it.

The plaintiff describes his invention as consisting of a series of strips of metal, connected by hinges;—that in itself is not new; nor is it new to form them without notches on the edges,—such strips, not having notches for the hinges or knuckles partially overlapping,—you will judge of the novelty by inspecting model B. The defendant, however, uses different hinges; indeed, a chain,—you will judge whether that variation is a legitimate variation, and an improvement, or only a colorable deviation.

If it is your opinion, from what has been advanced, that the plaintiff's patent is not, in fact, an invention, but a slight alteration from what has been known before, without any real improvement, then you will give your verdict for the defendant, because the patent will be bad; but if you are of opinion that his alterations and additions are new and useful, then you will find the pleas of the defendant groundless; and upon those pleas, the plaintiff will be entitled to your verdict. If, on the question of infringement, you think that the defendant has evasively imitated the plaintiff's patent, then you will give your verdict for the plaintiff; but if you consider that the defendant, knowing the plaintiff's and all the previous modes of making shutters, has, by a fair exercise of his ingenuity, adopted the chain connections, as, in his mind, a better thing, and not walked in the steps of the plaintiff, then you will give your verdict for the defendant.

The jury, consisting of eleven only (one having been excused by consent), then retired; and, after being locked up for nearly four hours, returned a verdict for the plaintiff.

COURT OF QUEEN'S BENCH.

Sittings at Nisi Prius, before Lord Chief Justice Denman and a Special Jury.—June 25th and 26th, 1845.

THE QUEEN *v.* THORNTON.

Mr. Fitzroy Kelly, Mr. Wortley, Q. C., Mr. Addison, Mr. Cowling, and Mr. Piggot, were for the Crown,—and Mr. Watson, Q. C., Mr. Butt, Q. C., and Mr. Webster, for the defendant.

This was an action, under a writ of *scire facias,* to set aside a patent granted to the defendant, William Carr Thornton, December 21st, 1841, "for certain improvements in machinery or apparatus for making cards for carding cotton and other fibrous substances," upon the ground of want of originality in the invention, and defective description in the specification.

Mr. Kelly opened the case against the patentee, and examined witnesses to show that in the six instances where invention had been set up in the specification of this patent, the patentee had withdrawn his claims to four of them, by a memorandum of alteration filed on the 12th of the present month, and that he also must forego his pretence to originality in the two remaining instances. A number of witnesses were called from the manufactories in the neighbourhood of Leeds and Cleckheaton, as well as machinists and practical engineers, to disprove the utility of the improvement and its originality with the patentee, in the two respects reserved in the specification. It was proved to have been a principle of movement, in respect to these machines, known as long ago as 1820; and that it was claimed by a Mr. Robertshaw, long since, as his invention. It was also proved that Mr. Thornton had instituted above twenty different actions in support of his right under the patent, with various success.

Mr. Watson addressed the jury in support of the patent. He admitted that the claims to invention originally made in the specification had been six in number, and that since the enrolment of the invention four out of the six had been abandoned and disclaimed by the patentee. He contended that in the two instances reserved in the specification there was an improvement introduced into the manufacture of this article, and that in the case of the suspension from the centres, and the application of the moving power from the fixed notched bar, the patentee had established his right to original invention, and consequently to protection. The jury would also find that the alleged invention of this patented machine, by Robertshaw, was disavowed by Robertshaw himself,—a most important fact, since Robertshaw's claim had formed an important ground with his learned friend (Mr. Kelly) for impeaching the right of the patentee to this invention.

Various witnesses were examined for the purpose of establishing the claim of the patentee to the invention and the value of the improvement made.

Several card-making machines were also exhibited in the court, to elucidate the statements of counsel and witnesses.

The Lord Chief Justice observed, this was a proceeding by the Crown, to set aside the patent, upon the ground generally that the patentee had not done what the law required in such cases, to protect his exclusive right. There was a remarkable feature in this case, for it was the first which he recollected of a disclaimer, on the part of the patentee, of several of the grounds upon which he had founded his claim to the patent. It was very important for the jury to consider well and discriminate what points the defendant disclaimed, and what he relied upon. As the principle of patents was of the nature of a monopoly—though qualified—it was of great importance to the public that patents in restriction of manufacture, or of productive industry, should not be improperly granted; and it was certainly important for the encouragement of ingenious artists and tradesmen, that they should be protected in the fruition of the temporary advantages secured to them by the letters-patent. The learned judge proceeded to read and comment upon the witnesses' statements on either side. He compared also, as he went along, the points of difference between the machine which was in use before this invention of Thornton's with the machine of Thornton's in court. It was in evidence that, as early as November, 1841, cards had been made by another machine, much upon the same principle—the invention of one Mordecai Robertshaw; and the jury would inquire and determine whether there were made by that machine cards identically the same as those made by Thornton's machine. The former machine had been bought of Robertshaw, on the

21st of August, 1842, and then Thornton, it appeared, began to make cards with it, and afterwards took Robertshaw into his service. It was not, therefore, the jury would see, so very extraordinary that Robertshaw, though he got but £30 for assignment to Thornton, should be willing to admit, as he had stipulated to do, in the assignment itself, all claim to or benefit from the invention. If the sale of his cards was, in their opinion, proof sufficient that the machine had been in public use, then they might infer that the invention was not that of the person purchasing the machine. It was said there were many errors in the specification; but it was urged, in reply to that statement, that they were such only as a competent workman could set right, when making the machine;—the omission was justifiable. For his part, he thought the specification ought to contain such directions as would inform the public of the means of applying the invention. Upon the whole, the jury were bound to consider whether the alleged improvements were new, and, if so, whether they were useful; and, lastly, whether they were so set out in the specification that a workman of competent skill could operate with the machine, in producing this article.

The jury retired for a quarter of an hour, and then returned a verdict for the Crown upon all the issues.

LIST OF REGISTRATIONS EFFECTED UNDER THE ACT FOR PROTECTING NEW AND ORIGINAL DESIGNS FOR ARTICLES OF UTILITY.

1845.

May 29. *Rock and Son,* of Hastings, for a pleasure carriage.

30. *Shoolbred, Loveridge, & Co.,* of Wolverhampton, for the pan of a shower bath.

30. *Edward Simons,* of 84, Dale-end, Birmingham, for a safety lamp.

31. *Frederick Gye, Junr.,* of Newgate-street, for a glass bottle for aerated liquids.

June 2. *Charles Baring Lander,* of 164, Strand, for a refrigerator.

3. *George Boswell,* of Harrow, and *George Rickets,* of Agar-street, London, for a fire-kindler and smoke elevator.

4. *William Johnson,* of Park Cottage, Sheffield, for an improved portable travelling trunk.

4. *John Jeremiah Rubery,* of Birmingham, for an elastic sliding ferrule to a walking stick, or umbrella stick.

June 4. *Henry Thomas Robert, & Edward Fownes*, of 4, Tavistock-street, Covent Garden, for a new seam for gloves.

4. *Edward Dingle*, of Callington, Cornwall, for a dibble.

5. *James Davidson*, of Paradise Row, Stockton-upon-Tees, Durham, for an improved inkstand.

5. *John Howell*, of St. Paul's Church Yard, for a reading easel.

7. *Thomas Jordery*, of 45, Wood-street, City, for a spring applicable to a stock or stiffener.

9. *William Rowland Gladwin*, of 62, Watling-street, London, for an improved machine for husking the ground nut.

11. *C. & H. C. Windle*, of Walsall, for a box inkstand.

12. *Sherwin, Cope, & Co.*, of Cumberland-street, Shoreditch, for an improved rotary press.

13. *Samuel Whitfield*, of Oxford-street, Birmingham, for a descending rack-pulley.

18. *John Manchee*, of Palatine-place, Stoke Newington-road, Middlesex, for a marine steam-propeller.

19. *Henry Madden*, of 14, George-street, Adelphi, London, for a portable cooking apparatus.

21. *John Inderwick*, of 58, Princes-street, Leicester-square, for a filtering tube for tobacco pipes.

26. *Douglas Hebson*, of 1, Dale-street, Liverpool, for an improved cast or wrought iron bridge, for the fires of steam and other boilers, with a valve and passage for the purpose of admitting air in order to burn the smoke or gases evolved during the combustion of the fuel.

List of Disclaimers
OF PARTS OF INVENTIONS AND
Amendments
MADE UNDER LORD BROUGHAM'S ACT.

Re Thornton.—Disclaimer filed with the clerk of the patents for England, on 12th June, 1845, to specification of patent granted 21st December, 1841, to William Carr Thornton, for certain improvements in machinery or apparatus for making cards for carding cotton, and other fibrous substances.

List of Patents

That have passed the Great Seal of IRELAND, to the 17*th of June*, 1845, *inclusive.*

To Thomas Dunn, of Manchester, in the county of Lancaster, engineer, for certain improvements in, or applicable to, turn-tables, to be used on, or in connection with, railways.—Sealed 2nd May.

Samuel Ellis, of Salford, Manchester, in the county palatine of Lancaster, engineer, for improvements in weighing-machines, and in turn-tables to be used on, or in connection with, railways, and in weighing-machines, to be used in other situations.—Sealed 23rd May.

Wilton George Turner, of Gateshead, in the county of Durham, Doctor in Philosophy, for an improved mode of directing the passage of, and otherwise dealing with, the noxious vapours and other matters arising from chemical works in certain cases.—Sealed 30th May.

William Wilcocks Sleigh, late of St. James's-square, in the county of Middlesex, but now of Stamford Brookhouse, in the same county, Doctor of Medicine and Surgeon, for an hydro-mechanic apparatus for producing motive power.—Sealed 6th June.

Charles Smith, of 13, Newcastle-street, Strand, in the county of Middlesex, Gent., for new and improved methods in the construction and application of a variety of cooking, culinary, and domestic articles and utensils, some of which are applicable to cleaning, and a variety of similar useful purposes.—Sealed 17th June.

Sir George Stewart M'Kenzie, of Coul, in the county of Ross, Bart., for an improvement or improvements in the manufacture of paper, more particularly for the purposes of writing and copying writings, and machinery for effecting the same; also the manufacture of a fluid or fluids to be used with the improved paper in the manner of ink.—Sealed 17th June.

Thomas Bazley, Jun., of Manchester, for improvements in tube flyers, used in machinery for roving and slubbing cotton and other fibrous substances.—Sealed 17th June.

List of Patents

Granted for SCOTLAND, subsequent to May 22nd, 1845.

To Henry Jones, of 36, and 37, Broad-mead, Bristol, baker, for a new preparation of flour for certain purposes.—Sealed 27th May.

Charles Joseph Hullmandel, of Great Marlborough-street, London, lithographer, for certain improvements in producing patterns upon earthenware and porcelain.—Sealed 30th May.

James Heath Lewis, of Dover, printer, for certain improvements in printing.—Sealed 2nd June.

John Kingsley Huntley, of John-street, Minories, London, merchant, for improvements in the manufacture of manure,—being a communication.—Sealed 4th June.

Arthur Parsey, of Spur-street, Leicester-square, London, artist and scientific draughtsman, for improvements in obtaining power.—Sealed 6th June.

Thomas Lawes, of Old Kent-road, London, for improvements in propelling carriages on rail and other roads, and boats or vessels on canals or rivers, which improvements are also applicable to machinery in general.—Sealed 9th June.

William Shepherd, of Manchester, calico printer, for certain improvements in the art of printing calicoes and other surfaces.—Sealed 11th June.

Benjamin Seebohm, of Horton Grange, Bradford, mechanist, for an improved mode of manufacturing certain descriptions of chains.—Sealed 11th June.

Joseph Washington Tyson, of Burton Crescent, London, engineer, for improvements in fire-arms and ordnance,—being a communication.—Sealed 12th June.

Joseph Quick, of Summer-street, Southwark, engineer, for an improvement in steam-engines.—Sealed 12th June.

John Dewrance, of Liverpool, engineer, for certain improvements in steam-boilers, and in the construction, composition, and manufacture of bearings, steps, and other rubbing surfaces of steam-engines and other machinery; and also of a method of lubricating the same.—Sealed 16th June.

Henry Whiting, of Southwark Bridge-road, London, hatter's furrier, for certain improvements in machinery or apparatus for shaping the brims of hats.—Sealed 17th June.

Warren Delarue, of Bunhill-row, London, manufacturer, for improvements in covering the surfaces of paper and other materials with color and other surfaces.—Sealed 17th June.

Lawrence Hill, Jun., of Glasgow, civil and mechanical engineer, for an improved brake for railway carriages.—Sealed 19th June.

David Henderson, of London Works, Renfrewshire, civil engineer, for certain improvements in cranes.—Sealed 19th June.

New Patents
SEALED IN ENGLAND.
1845.

To Charles William Firchild, of Birmingham, Gent., for an improved cutting, slicing, grinding, and rasping machine. Sealed 29th May—6 months for inrolment.

Charles Keene, of Sussex-place, Regent's Park, Esq., for improvements in boots, shoes, gaiters, overalls, and other like articles of apparel. Sealed 29th May—6 months for inrolment.

John Naylor, of Goole, in the West Riding of York, agricultural implement maker, for improvements in the machinery or apparatus for crushing, tearing, and pulverizing arable land. Sealed 31st May—6 months for inrolment.

John Masters, of Welford-place, Leicestershire, Gent., for certain improvements in trouser-fastenings, and in attaching the same; and also in the application of an elastic material, or fabric, to trousers and other articles of dress. Sealed 31st May—6 months for inrolment.

William Palmer, of Sutton-street, Clerkenwell, for improvements in the manufacture of candles and lamps, and shades or chimneys. Sealed 2nd June—6 months for inrolment.

Cornelius Whitehouse, of Wolverhampton, gun-barrel manufacturer, for improvements in machinery for welding and hammering, and in the manufacture of gun-barrels and other tubes. Sealed 3rd June—6 months for inrolment.

William Lucy, of Birmingham, miller and baker, for improvements in preparing dough. Sealed 3rd June—6 months for inrolment.

Moses Poole, of Serle-street, London, Gent., for improvements in the construction of vessels to contain liquids and substances; and in the means of impregnating liquids with gases; and in drawing off such liquids from such vessels; and in closing such vessels,—being a communication. Sealed 3rd June—6 months for inrolment.

John Reading, of Birmingham, manufacturer, for certain improvements in fastenings for articles of dress. Sealed 3rd June—6 months for inrolment.

John Davis, of Brettell-lane, Stafford, glass manufacturer, for a certain improvement or certain improvements in, or applicable to, lamps. Sealed 3rd June—6 months for inrolment.

William Coston Aitken, of Birmingham, Clerk of Works, for a certain improvement or certain improvements in ornamenting cornices, ends for cornice poles, and other rods, curtain bands, and certain other articles. Sealed 3rd June—6 months for inrolment.

John Lionel Hood, of St. John's Wood, Gent., for improvements in the application of motive power for locomotive and other purposes,—being a communication. Sealed 3rd June—6 months for inrolment.

William Newton, of the Office for Patents, 66, Chancery Lane, civil engineer, for certain improvements in dyeing cotton, flaxen and hempen yarns, and fabrics,—being a communication. Sealed 3rd June—6 months inrolment.

Pierre Thirion, of Hitts Place, Clerkenwell, fur skin dresser, for certain improvements in dressing furs and skins,—being a communication. Sealed 3rd June—6 months for inrolment.

William Brent Brent, of Gower-street, Bedford-square, barrister at law, for certain improvements in machinery, for cutting or excavating and removing earth. Sealed 3rd June—6 months for inrolment.

Thomas Lawes, of Old Kent Road, Surrey, Gent., for improvements in propelling carriages on rail and other roads, and boats or other vessels on canals or rivers, which improvements are also applicable to machinery in general. Sealed 3rd June—6 months for inrolment.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for improvements in working atmospheric railways, and in lubricating railway and other machinery. Sealed 5th June—6 months for inrolment.

Joseph Cliff, of Wortley, fire-brick manufacturer, for improvements in the manufacture of alum and of aluminous compounds, from a substance not hitherto used for that purpose; and in the production of an improved fire-clay from the residuum thereof. Sealed 5th June—6 months for inrolment.

Henry Carr, of Abingdon, Berks, butcher, for certain improvements in the construction of temporary roofs or coverings. Sealed 5th June—6 months for inrolment.

James Hardy, of Birmingham, Gent., for improvements in the manufacture of metallic tubes or pipes, by machinery. Sealed 5th June—6 months for inrolment.

William Willcocks Sleigh, of Stamford Brook House, Chiswick, doctor of medicine and surgeon, for a hydro-mechanic apparatus for producing motive power, to extend to the colonies only. Sealed 7th June—4 months for inrolment.

Samuel Harvey, of Halesworth, in the county of Suffolk, cabinet-maker, for certain improvements in sawing machinery. Sealed 7th June—6 months for inrolment.

David Henderson, of London Works, Renfrew, civil engineer, for certain improvements in cranes. Sealed 10th June—6 months for inrolment.

Thomas Silver Shaw, of Birmingham, pawnbroker, for a certain improvement or certain improvements in the construction of roasting-jacks. Sealed 10th June—6 months for inrolment.

James Murdoch, of Staple Inn, mechanical draughtsman, for a certain improvement or certain improvements in dyeing,—being a communication. Sealed 10th June—6 months for inrolment.

John Fisher, the younger, of Radford Works, Nottingham, Gent.; James Gibbons, of New Radford, machinist; and Thomas Roe, of New Radford, machinist, for certain improvements in the manufacture of lace or net, and other fabrics; and certain improvements in machinery for figuring or ornamenting lace or net, and other fabrics. Sealed 10th June—6 months for inrolment.

Thomas Smith, of Wood-street, Cheapside, Gent., for improvements in suspending carriages, and in the construction of wheels for carriages. Sealed 10th June—6 months for inrolment.

Joseph Washington Tyson, of Burton-crescent, Esq., for improvements in fire-arms and ordnance,—being a communication. Sealed 10th June—6 months for inrolment.

Robert Brooks, jun., of St. Alban's, tallow chandler, for certain apparatus for facilitating the playing on stringed musical instruments. Sealed 12th June—6 months for inrolment.

Thomas Willis, of Manchester, machine-maker and iron-founder, for certain improvements in machinery for spinning, doubling, and winding cotton, silk, woollen, and linen yarns, warp, and weft, to be used for all manufacturing purposes to which the same are applicable. Sealed 12th June—6 months for inrolment.

Frederick Rosenborg, of Kingston-upon-Hull, Gent., for improvements in the arrangement or construction of machinery or apparatus for propelling or impelling vessels, and in steering or manœuvring the same. Sealed 12th June—6 months for inrolment.

Benjamin Fothergill, of Manchester, machine-maker, for improvements in certain parts of machinery used in the preparation for spinning, and in the spinning and doubling of cotton, wool, and other fibrous substances. Sealed 17th June—6 months for inrolment.

Auguste Cherot, of Nantes, in the kingdom of France, spinner, for certain improvements in machinery for spinning flax, hemp, and other fibrous materials. Sealed 17th June—6 months for inrolment.

Richard Archibald Brooman, of Fleet-street, London, Gent., for certain improvements in machinery for weaving,—being a communication. Sealed 18th June—6 months for inrolment.

Charles Hague, of Oldham, Lancaster, brass-founder, and William Madeley, of Manchester, machine-maker, for improvements in, or applicable to, certain machines employed in the slubbing, roving, or preparing to be spun, of cotton and other fibrous substances; and an improved apparatus for lubricating shafts and bearings of or in such machines, for the purpose of reducing friction; and which apparatus is also applicable to other shafting and machinery. Sealed 19th June—6 months for inrolment.

Michel Antoine Bertin Burin du Buisson, of Lamb's Conduit-street, chemist, for new and improved methods for the distillation of bituminous schistus, and other bituminous substances, as well as for the purification, rectification, and preparation necessary for the employment of the productions obtained by such distillation for various useful purposes. Sealed 19th June—6 months for inrolment.

Moses Poole, of Lincoln's Inn, Middlesex, Gent., for improvements in apparatus for withdrawing air, gases, and other vapours,—being a communication. Sealed 23rd June—6 months for inrolment.

Thomas Aspinwall, of Bishopgate church-yard, Esq., for improvements in ordnance carriages, comprising apparatus for governing the recoil, and likewise for moving the piece of ordnance backwards and forwards,—being a communication. Sealed 23rd June—6 months for inrolment.

John Field, jun., of West Brixton, Gent., for improvements in apparatus for ascertaining the alcoholic strength of liquids,—being a communication. Sealed 23rd June—6 months for inrolment.

William Morris, of Thanet-place, Strand, civil engineer, for improvements in the apparatus and machinery for tilling and draining land. Sealed 23rd June—6 months for inrolment.

Thomas Clarke, of Hackney, Middlesex, engineer, and John Varley, of Poplar, engineer, for an improvement on the atmospheric system of propulsion, which is also applicable to other motive purposes. Sealed 23rd June—6 months for inrolment.

Henry Whiting, of Southwark-bridge road, hatter's furrier, for certain improvements in machinery or apparatus for shaping the brims of hats,—being a communication. Sealed 23rd June—6 months for inrolment.

William Pollard, of Newcastle-upon-Tyne, Gent., for certain improvements in the production of combustible gases, and in the application of the same as fuel. Sealed 23rd June—6 months for inrolment.

Robert Griffiths, of Havre, in the kingdom of France, George Hinton Bovill, of Millwall, and George Hennett, of Bristol, engineers, for improvements in the construction of parts of apparatus used for propelling carriages and vessels by the atmosphere, and improvements in propelling carriages and vessels by atmospheric pressure. Sealed 23rd June—6 months for inrolment.

Joseph Zambaux, of Paris, chemist, for improvements in atmospheric railways. Sealed 25th June—6 months for inrolment.

William Sykes Ward, of Leeds, Gent., for improvements in exhausting air from tubes or vessels for the purpose of working atmospheric railways, and for other purposes. Sealed 25th June—6 months for inrolment.

James Augustus Dorr, of the city, county, and State of New York, for certain improvements in machinery or apparatus for knitting. Sealed 25th June—6 months for inrolment.

CELESTIAL PHENOMENA FOR JULY, 1845.

D.	H.	M.	
1			Clock before the sun, 3m. 27s.
—			☽ rises 1h. 30m. M.
—			☽ passes mer. 9h. 29m. M.
—			☽ sets 5h. 35m. A.
	19	25	♅ in □ with the ☉
2	11	6	☉ in Apogee
3	14	40	♃'s first satt. will. im.
	15		☽ in Apogee
4	1	19	☿ in conj. with the ☽ diff. of dec. 4. 56. N.
	4	30	Ecliptic conj. or ● new moon
5			Ceres stationary
—			Clock before the sun, 4m. 11s.
—			☽ rises 4h. 52m. M.
—			☽ passes mer. 0h. 41m. A.
—			☽ sets 8h. 19m. A.
	12	57	♃'s second sat. will em.
	13	19	☿ in super conj. with the ☉
		29	♀ in conj. with the ☽ diff. of dec. 6, 1. N.
9			Occul. *g*1 Leonis, im. 8h. 36m. em. 9h. 32m.
10			Clock before the sun, 4m. 59s.
—			☽ rises 10h. 18m. M.
—			☽ passes mer. 4h. 22m. A.
—			☽ sets 10h. 14m. M.
12	2	22	☽ in □ or first quarter
	13	6	♃'s second sat. will im.
	15	34	♃'s second sat. will em.
11	5	52	☿ greatest hel. lat. N.
12			Pallas in Aphelion
14	12	24	♃'s third satt. will im.
14	14	41	♃'s third sat. will em.
15			Clock before the sun, 5m. 36s.
—			☽ rises 4h. 22m. A.
—			☽ passes mer. 8h. 40m. A.
—			☽ sets 0h. 8m. M.
	14	41	♅ stationary
			Occul. *w* Ophiuchi im. 12h. 23m. em. 13h. 17m.
16			Mercury R. A. 8h. 32m. dec. 20. 41. N.
—			Venus R. A. 8h. 53m. dec. 19. 3. N.
—			Mars R. A. 22h. 18m. dec. 16. 37. S.
—			Vesta R. A. 3h. 45m. dec. 14. 8. N.
—			Juno R.A. 10h.52m. dec. 8. 20. N.

D.	H.	M.	
—			Pallas R. A. 20h. 20m. dec. 17. 46. N.
—			Ceres R. A. 22h. 45m. dec. 21. 51. S.
—			Jupiter R. A. 2h. 22m. dec. 12. 55. N.
—			Saturn R. A. 21h. 20m. dec. 16. 41. S.
—			Georg. R. A. 0h. 38m. dec. 3. 24. N.
—			Mercury passes mer. 0h. 56m.
—			Venus passes mer. 1h. 16m.
—			Mars passes mer. 14h. 39m.
—			Jupiter passes mer. 18h. 43m.
—			Saturn passes mer. 13h. 41m.
—			Georg. passes mer. 16h. 59m.
			Occul. 2 Sagittarii, im. 13h. 33m. em. 14h. 19m.
18	3		☽ in Perigee
19	6	3	Ecliptic oppo. or ○ full moon
	12	25	♃'s first satt. will. im.
20			Clock before the sun, 6m. 0s.
—			☽ rises 8h. 25m. A.
—			☽ passes mer. 0h. 47m. M.
—			☽ sets 5h. 50m. M.
			Occul. *c*1 Capricorni, im. 12h. 39m. em. 13h. 51m.
	19	13	♂ stationary
			Occul. *k* Aquarii, im. 11h. 15m. em. 12h. 16m.
21	7	35	♂ in conj. with the ☽ diff. of dec. 11. 45. S.
22	17	9	☿ greatest hel. lat. N.
24	0	11	♅ in conj. with the ☽ diff. of dec. 4. 25. S.
	21	25	☿ in conj. with ♀ diff of dec. 0h. 17m. S.
25			Clock before the sun, 6m. 10s.
—			☽ rises 10h. 29m. A.
—			☽ passes mer. 5h. 3m. M.
—			☽ sets 0h. 15m. M.
26	3	20	☽ in □ or last quarter
26	4	25	♃ in conj. with the ☽ diff. of dec. 2. 33. S.
	14	49	♃'s first sat. will im.
30	21		☽ in Apogee
31	1[illegible]	[illegible]8	Pallas in oppo. to the ☉, intens. of light 0·311

J. LEWTHWAITE, Rotherhithe.

INDEX TO VOL. XXVI.

[CONJOINED SERIES.]

Page

Adjudications, Scientific,—

————, Allen *v.* Rawson .. 262

————, Bunnett *v.* Smith .. 431

————, Dircks *v.* Mellor.... 269

————, Emmerson *v.* Hogg and Delamater 113

————, Goodfellow *v.* Swinglehurst.................. 193

————, Heath *v.* Unwin.... 108

————, Kennedy and Asprey *v.* Coombs and Finlay 111

————, Lowe *v.* Penn.... 47, 52

————, Newall *v.* Webster 52, 58

————, Queen *v.* Newton .. 361

————, Queen *v.* Thornton.. 441

————, Stocker *v.* Warner.. 110

Alloys of metals, improvements in manufacturing, Parkes' patent 378

————————, Weiger's patent 396

Alterations or Amendments of Specifications, and Titles to Patents, list of 60, 444

American Patents, reports of the following :—shovel, plough, cleaning grain, boat oars, boot-crimp, saw-mill, ditto, planting-plough, 103. — plough, forging anvils, a new paint, ships' blocks, lining axle boxes, cotton press, lamps, grinding grain, 189. — bee-hives, boring timber, blacksmiths' forge, barrels, fire-arms, detaching horses from carriages, washing machine, grinding grain, hulling rice, steam boilers, crimping leather, washing machine, 340. — saw-mill, ditto, ice-breaker, bench-vice, preserving tobacco, hinges, barrels, fire-arms, 405.

Page

Alum, improvements in making, Birkmyre's patent 254

Antirrhinic acid, notice of 428

Axletrees, improvements in, Millichap's patent 389

Blasting rocks, new mode of .. 359

Bleaching, improvements in re-converting manganese, when used in, De Sussex & Arrott's patent 149

Boilers for evaporating, improvements in, Higham and Bellhouse's patent 84

Boots, improvements in rivetting the soles of, Harbottle's patent 85

Boring, improved machinery for, Fuller's patent 373

Bricks, improved machine for making, Worby's patent 80

Brushes, improved construction of, Insole's patent 232

————, Metcalfe's patent 387

Bungs, or stoppers, improvements in, Hancock's patent 81

——————, securing them in bottles, Leroy's patent .. 393

Buttons, improvements in making covered, Elliott's patent 93

Calcining, improved apparatus for, Kurtz' patent.......... 31

Calendering and calico printing, improvements in, Ferguson and Clark's patent 168

Camera obscura, improvements in, Newton's patent 225

Candles, improvements in making, Humfrey's patent...... 32

——————, Poole's patent.. 96

——————, Power's patent 187

——————, Wilson's patent 165

——————, Wilson, Gwynne, and Wilson's patent 381

Page
Carding engines, improvements in, Brown and Walker's patent 15
Carving wood, improved machinery for, Irving's patent 221
——, a substitute for the process of, Wood's patent 314
Caulking ships, boats, &c., improvements in, Coote's patent 91
Celestial Phenomena, 68, 140, 220, 300, 372, 452
Chaff-cutters, machinery for driving, Vibart's patent 315
Chimneys, improvements in, Wilson's patent 19
Chlorazotic acid, notice of 426
Civil Engineers' Society, Report of the Transactions of the, 41, 116, 197, 259, 346, 409
Coating nails, screws, nuts, bolts, &c., with copper, Blackwell and Norris' patent 16
Coke ovens, mode of obtaining heat from, Palmaert's patent 141
Combing wool, improvements in, Lister's patent 259
Condensing noxious vapours, improvements in, Turner's patent 337
Copper, improvements in depositing, Blackwell and Norris' patent 16
——, from ores, improvements in obtaining, Newton's patent 325
——, Ritchie's patent 252
Corks, or stoppers, improvements in constructing, Hancock's patent 81
——, securing them in bottles, Leroy's patent .. 393
Corrugated plates, improvements in producing, Spencer's patent 384
Cutlery, improvements in producing the edge of, Boydell's patent 184
Dead-eyes for ships' rigging, improved construction of, Chatten's patent 92
Decorations, a cement for architectural and other, Albano's patent 403
——, Chabert's patent 323
Designs registered under the new Act, list of, 59, 132, 212, 290, 363, 443
Disclaimers of parts of Inventions, and Titles to Patents, list of 60, 444
Drawing frames, improvements in, Johnson's patent........ 39

Page
Drawings of models, &c., mode of obtaining, Lorimier's patent 241
——, improvements in copying, Newton's patent 225
Dredging machines, mode of actuating, Aitkens' patent .. 319
Dyeing, an improved preparation for, Metcalf's patent .. 324
Electro-deposition, coating nails, screws, bolts, &c., with copper, by means of, Blackwell and Norris' patent 16
——, improvements in, Parkes' patent 378
——, obtaining copper from ores, by means of, Ritchie's patent 252
Engines, improvements in the condensers of steam, Aitken's patent 319
——, improvements in cutting off the steam from, Petrie's patent 1
——, improved construction of air and gas, Robinson's patent 24
Envelopes, mode of cutting paper for, Wilson's patent 30
Evaporating, improved apparatus for, Higham and Bellhouse's patent 84
——, Kurtz' patent...... 31
Fastenings for engineering purposes, Barlow's patent...... 400
——, for gloves, improvements in, Petit's patent 98
Fats, improved mode of treating, Wilson's patent 165
——, Wilson, Gwynne, and Wilson's patent 381
Fire-arms, improvements in discharging, Shaw's patent 71
Furnaces, improvements in, Bedington's patent 79
——, Wilson's patent 19
——, for evaporating, improvements in, Kurtz' patent 31
Fuel, machinery for compressing, Middleton's patent 229
Fustians, improvements in finishing, Whitehead's patent 98
Glass, improvements in making, Ewing's patent............ 176
——, Powell's patent 102
Gloves, an improved fastening for, Petit's patent.......... 98
——, improvements in cutting out, Pritchett's patent 309

Page
Gold, mode of extracting from copper ores, Newton's patent 325
——, and its oxides, notice of.. 427
Grinding, making artificial stone for, Ransome's patent 307
Harness, improvements in rivetting, Harbottle's patent 84
————, for draught horses, improvements in, Bencraft's patent 102
————, improved construction of saddle-trees, Bencraft's patent 100
Hats, improvements in manufacturing, Simpson's patent.. 158
Heat, mode of obtaining from coke ovens, Palmaert's patent 141
Hides and skins, improvements in tanning, Squire's patent.. 306
————, Turnbull's patent.. 234
Hose, improvements in rivetting leather, Harbottle's patent 84
India rubber, new applications of, Brockedon's patent 183
——————, a new preparation of, Hancock's patent 178
Iron, improvements in coating with copper, Blackwell and Norris' patent 16
——, improvements in manufacturing, Low's patent 17
Keys, or wedges, for engineering purposes, improvements in, Barlow's patent 400
Lac, improvements in purifying, De Normandy's patent 401
Lace, improvements in printing upon, Smith's patent 399
Leather, improvements in printing upon, Guigues' patent .. 256
——————, rivetting, Harbottle's patent 85
Life-boats, a new construction of, Monzani's patent 155
Looms, improvements in power, Noton's patent 251
Manganese, improvements in treating, when used in bleaching, De Sussex and Arrott's patent 149
Manure, improved manufacture of, Poole's patent.......... 96
Metals, improvements in coating iron with, Blackwell and Norris' patent 16
——————, alloying and depositing, Parkes' patent 378

Page
Metals, improvements in alloying and depositing for dental purposes, Weiger's patent 396
Musical instruments, improvements in covering the keys of, Brockedon's patent 183
Oils, improvements in treating, Poole's patent 96
——————, Power's patent 187
——————, Wilson's patent 165
——, mode of purifying linseed 361
Paper, mode of cutting for envelopes, Wilson's patent 30
——, improvements in manufacturing, Poole's patent 95
Patents, list of new, granted in England, 63, 136, 216, 293, 366, 447
————————, in Ireland, 61, 133, 213, 291, 365, 445
————————, in Scotland, 61, 134, 214, 292, 365, 446

Patents, Reports of Recent.

Aitken, J., for improvements in atmospheric railways 318
———, for impts. in steam-engines, dredging-machines, canal navigation, &c. 319
Albano, B., for improvements in making ornamental mouldings 403
Anderson, J. B., for improvements in manufacturing soap 392
Arrott, A. R., & De Sussex, F.S., for improvements in the recovery of manganese used in making bleaching powder .. 149
Atkinson, S., for improvements in carriage wheels 336
Baillie, B., for improvements in ventilating buildings 391
Barlow, W. H., for improved fastenings for railway purposes 400
Bedington, W., for impts. in furnaces 79
Bellhouse, D., and Higham, W., for improvements in boilers for evaporating saline & other solutions 84
Bencraft, S., for improvements in saddle-trees 100
————, for improvements in harness 102
Birkmyre, W., for improvements in manufacturing alums, sulphuric acid, and sulphate of soda 254

Page
Blackwell, B. B., & Norris, W., for improvements in coating iron with copper 16
Boydell, J., for improvements in manufacturing metals for edge tools 184
Brockedon, W., for impts. in covering roofs, railway sleepers, valves, &c. 183
Brown, H., and Walker, T., for impts. in carding-engines .. 15
Buck, G. W., and Lacy, H. C., for improvements in railway sleepers.................. 394
Carter, J., for a machine for cutting slate 241
Chabert, J. E., for a new plastic composition 323
Chappé, J. B. P., for improved machinery for spinning and doubling fibrous materials .. 303
Chatten, J. P., for improvements in ships' dead-eyes 92
Clark, J., and Ferguson, R., for improvements in printing and calendering 168
——, T., for an improved portable water closet 250
Cooper, H., for improved machinery for doubling fibrous materials 301
Coote, S., for a new material for caulking ships 91
Cowen, J., for improvements in making gas retorts 9
Craig, W., and Jarvie, R., and J., for improved machinery for preparing & spinning fibrous materials 21
De Normandy, A. Le M., for improvements in purifying lac 401
De Sussex, F. S.,& Arrott, A. R., for improvements in the recovery of manganese used in making bleaching powder .. 149
Elliott, W., for impts. in manufacturing covered buttons .. 93
Ewing, A., for improvements in the manufacture of crown-glass 176
Ferguson, R., and Clark, J., for improvements in printing and calendering 168
Fuller, T., for apparatus for turning and boring metals .. 373
Gamble, J. C., for improvements in manufacturing sulphuric acid 386

Page
Groom, J., for improved machinery for preparing, slubbing, and roving fibrous materials 304
Guigues, E., for improvements in printing on leather and skins 256
Gwynne, G., and Wilson, G. F., and J. P., for improvements in treating fatty matters 381
Hancock, C., for improvements in making articles of cork, and other materials............ 81
————, T., for improvements in treating India rubber 178
Harbottle, T., for a machine for rivetting leather 85
Harrison, J., for apparatus for spinning 375
Hays, C. D., for improvements in propelling vessels 171
Heaton, T., for improvements in hydraulic machinery 147
Heimann, J. B. F. W., for improvements in manufacturing wire ropes 34
Higham, W., and Bellhouse, D., for improvements in boilers for evaporating saline and other solutions 84
Humfrey, C., for improvements in the manufacture of candles 32
Insole, J., for improvements in the manufacture of brushes.. 232
Irving, W., for improved machinery for carving wood, &c. 221
Jarvie, R. and J., and Craig, W., for improved machinery for preparing and spinning fibrous materials 21
Johnson, W., for improvements in machinery for preparing fibrous materials 39
Kronheim, J. M., for improvements in stereotyping 161
Kurtz, A., for improvements in apparatus for drying, evaporating, &c. 31
Lacy, H. C., and Buck, G. W., for improvements in railway sleepers 394
Leroy, N., for improvements in covering bottles and jars.... 393
Lister, S. C., for improvements in preparing and combing wool 259
Lorimier, A., for improvements in facilitating drawing from nature or models 241
Low, C., for improvements in manufacturing iron and steel 17

Page
Metcalf, D., for a new dyeing material 324
Metcalfe, T., for improvements in brooms and brushes 387
Middleton, T., for improved machinery for moulding artificial fuel 229
Millichap, G., for improvements in axletrees 389
Monzani, W. T., for improvements in constructing life-boats 155
Newton, W., for improvements in manufacturing zinc wire.. 311
———, for improvements in obtaining copper and other metals from copper ores 325
———, W. E., for improved apparatus for copying drawings, &c. 225
———, for improvements in paddle-wheels 243
Norris, W., and Blackwell, B. B., for improvements in coating iron with copper 16
North, W., for improvements in slate roofing 324
Noton, T., for improvements in power looms 251
Onions, G., for improved railway wheels and rails 258
Palmaert, J. A., for improvements in economizing and applying heat 141
Parkes, A., for improvements in forming alloys, and depositing metals 378
Petit, C. F. J., for improvements in fastenings for gloves 98
Petrie, J., for improvements in steam engines 1
Poole, M., for making paper from a new material........ 95
———, for improvements in the manufacture of oils, candles, and manure 96
Powell, N. and A., for improvements in manufacturing quarries and other panes of glass 102
Power, J., for improvements in making candles, soap, &c. .. 187
Pritchett, S., for improvements in manufacturing gloves 309
Ransome, F., for improvements in manufacturing artificial stone 307
Ritchie, W. H., for impts. in obtaining copper from ores.... 252

Page
Robinson, J., for improvements in air or gas engines 24
Saunders, J., for improvements in making wheel-tires 322
Shaw, J., for improvements in discharging fire-arms 71
Sheppard, E., for machinery for planing, sawing, and cutting wood 69
Simpson, A., for improvements in manufacturing hats 158
Smith, J., for improvements in printing on lace 399
Spencer, J., for improvements in making corrugated metal plates 384
Squire, T., for an improved tanning apparatus 306
Turnbull, A., for improvements in tanning................ 234
Turner, W. G., for improvements in treating noxious vapours, &c.............. 337
Vibart, J., for apparatus for communicating manual power to agricultural & other machines 315
Walker, T., and Brown, H., for improvements in carding engines 15
Watterson, C., for improvements in making soap 13
Weiger, J., for improvements in alloying and soldering metals 396
Whitehead, J., for improvements in finishing fustians & similar fabrics 98
Wilson, G., for improvements in cutting paper for envelopes 30
———, G. F. and J. P., and Gwynne, G., for improvements in treating fatty matters 381
———, G. G., for improvements in fire-places and chimneys.. 19
———, J. P., for improvements in treating fatty and oily matters, and making candles.... 165
Wood, H. W., for improvements in embossing or ornamenting wood, &c. 314
Worby, W., for improved machinery for making bricks, tiles, &c.................. 80

Photogenic paper, mode of preparing 430
Picture frames, a cement for the ornaments of, Chabert's patent 323
Planing wood, improved machinery for, Sheppard's patent.. 69

Page

Plumbic acid, notice of 429

Polariscope, notice of a natural 426

Power, machinery for applying, Vibart's patent 315

Printing on lace, Smith's patent 399

—— leather, Guigues' patent 256

—— various substances, Ferguson and Clark's patent ... 168

Propelling vessels by atmospheric pressure, Aitken's patent 319

——, improved apparatus for, Newton's patent ... 243

——, regulating the speed of paddle-wheels and screws used in, Hay's patent 171

Pumps, improved construction of, Heaton's patent 147

Rails for railways, improvements in making, Onions' patent .. 258

Railways, covering sleepers of, and also the valves of atmospheric, Brockedon's patent .. 183

——, improved keys or wedges for, Barlow's patent........ 400

——, improvements in atmospheric, Aitken's patent 318

——, sustaining the rails of, Lacy and Buck's patent .. 394

——, improvements in wheels for, Saunders' patent 322

Raising heavy bodies, improvements in, Aitken's patent .. 319

Registrations effected under the new Act, list of, 59, 132, 212, 290, 363, 443

Retorts, machinery for making, Cowen's patent............ 9

Rigging, improved construction of dead-eyes for ships, Chatten's patent 92

Rivetting leather, improved machine for, Harbottle's patent 85

Roofing, an improved composition for, Brockedon's patent 183

——, an improved slate, North's patent 324

——, improvements in cutting slate for, Carter's patent.... 241

——, preparing metal plates for, Spencer's patent 384

Ropes, improved machinery for making, Craig and Jarvie's patent 21

——, improvements in making wire, Heimann's patent 34

Roving cans, improvements in compressing cotton into, Johnson's patent 39

Rudders, improvements in hanging, Monzani's patent 155

Saccharic acid, notice of 427

Sawing wood, improved machinery for, Sheppard's patent 69

Shellac, improvements in making, De Normandy's patent 401

Ships, improvements in caulking, Coote's patent 91

Silver, mode of extracting, from copper ores, Newton's patent 325

Slates for roofing, improvements in combining, North's patent 432

——, cutting, Carter's patent 241

Sleepers for railways, improvements in, Lacy and Buck's patent 395

Soap, improvements in producing, Anderson's patent .. 392

——, Power's patent ... 187

——, Watterson's patent 13

Soda, improvements in making sulphate of, Birkmyre's patent 254

Spinning hemp, improvements in machinery for, Craig and Jarvie's patent 21

——, improvements in, Chappè's patent 303

——, Cooper's patent .. 301

——, Groom's patent ... 304

——, Harrison's patent 375

Stearine, improvements in producing, Poole's patent...... 96

Steel, improvements in manufacturing, Low's patent 17

Stereotyping, improvements in, Kronheim's patent 161

Stone, mode of preserving statues of 46

——, for grinding, improvements in making artificial, Ransome's patent 307

Stoppers and bungs, improvements in, Hancock's patent 81

——, securing them in bottles, Leroy's patent...... 393

Sulphacetic acid, notice of 428

Sulphuric acid, improvements in making, Birkmyre's patent 254

——, Gamble's patent 386

Tanning, a new mode of, Turnbull's patent 234

——, improvements in, Squire's patent............ 306

Thrashing machines, apparatus for driving, Vibart's patent 315

Page
Tiles, improved machine for making, Worby's patent 80
Tools for cutting, mode of producing the edge of, Boydell's patent 184
Turning, improved machinery for, Fuller's patent 373
Valves of atmospheric railways, improvements in covering, Brockedon's patent 183
Vapours, mode of condensing noxious, Turner's patent.... 337
Ventilating buildings, improvements in, Baillie's patent .. 391
Water-closet, an improved portable, Clark's patent 250
Weaving, an improved power loom for, Noton's patent.... 251

Page
Wheels for carriages, improvements in making, Atkinson's patent 336
————, Onions' patent 258
————, Saunders' patent 322
Wire, machine for making zinc, Newton's patent 311
Wood, improved machinery for cutting and carving, Irving's patent 221
————, Sheppard's patent 69
———, producing devices in, Wood's patent 314
Wool, improvements in preparing and combing, Lister's patent 259
Zinc wire, machine for cutting, Newton's patent 311

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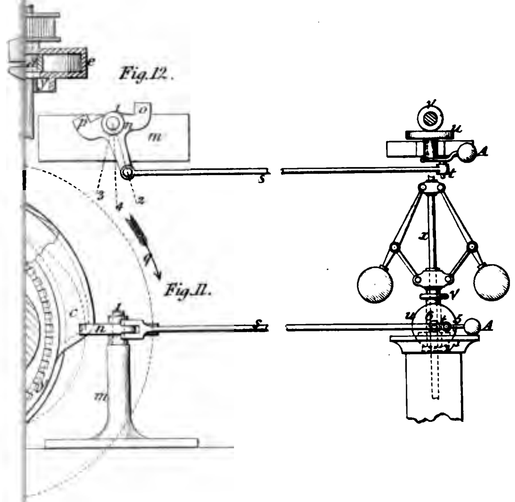
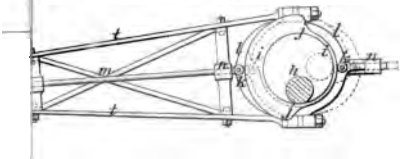
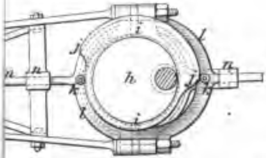
Fig. 12.

Fig. 11.







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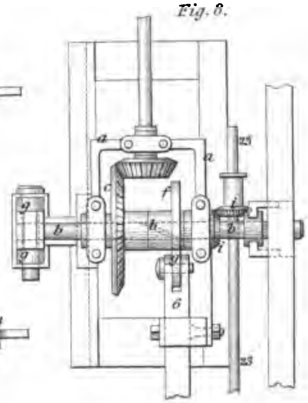

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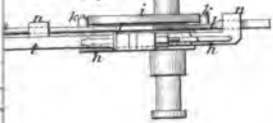

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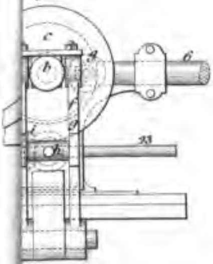

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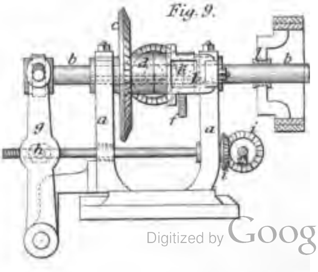

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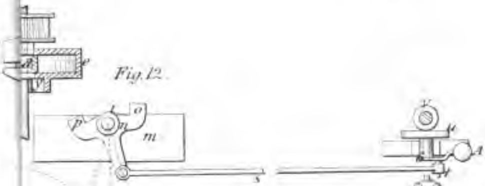

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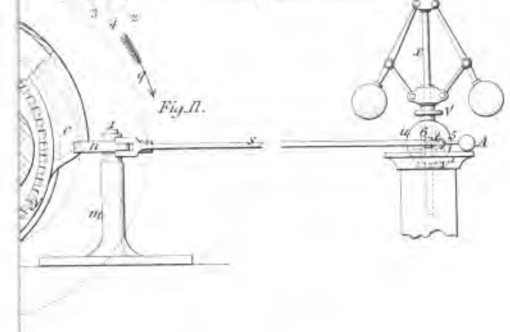

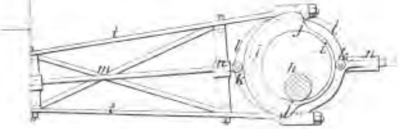

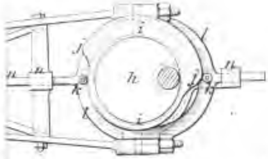

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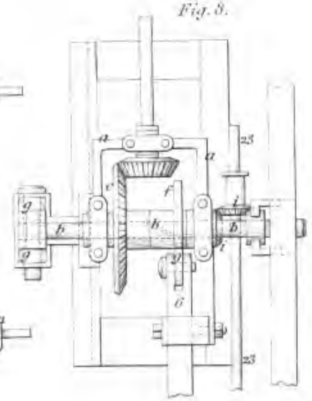

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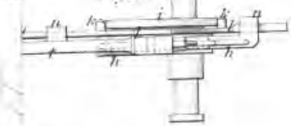

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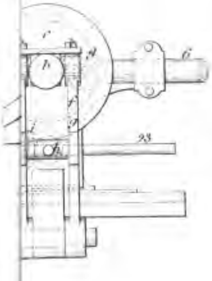

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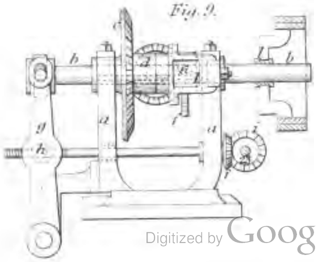

W. Newton

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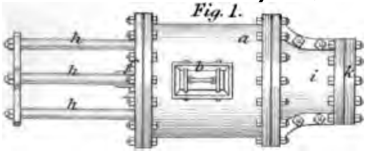

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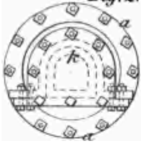

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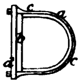

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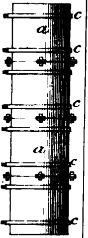

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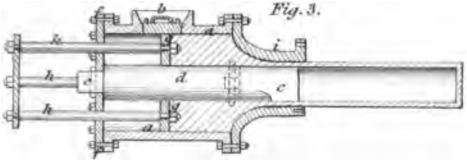

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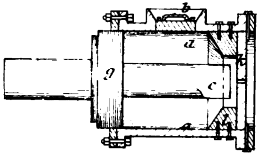

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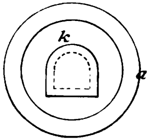

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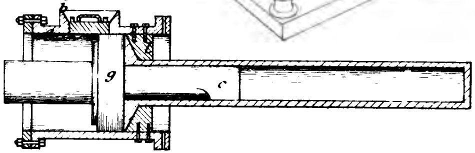

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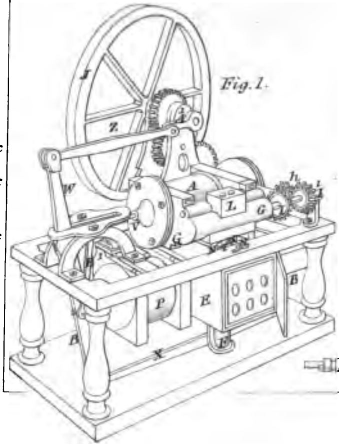

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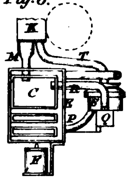

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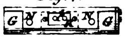

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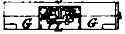

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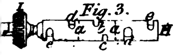

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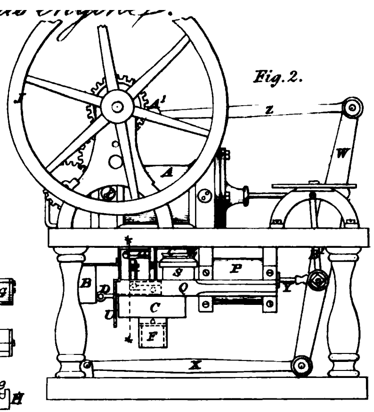
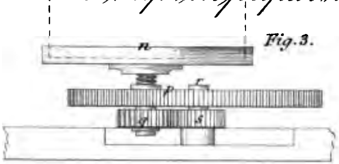


Johnson's imp.ts in prepar.g cotton.

Fig. 3.



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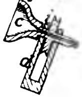

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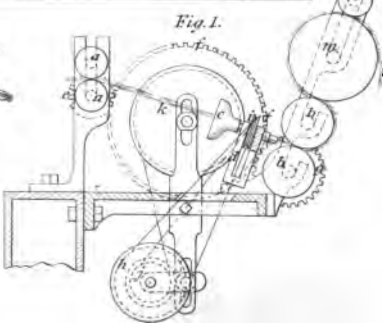

Hurtz's imp.d furnace for drying and evaporating.

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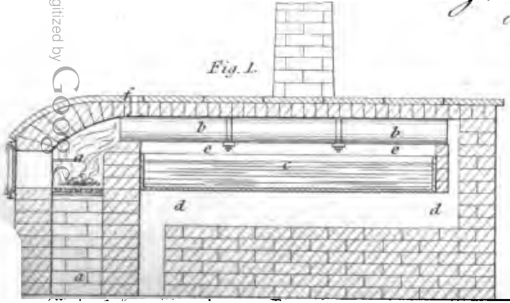

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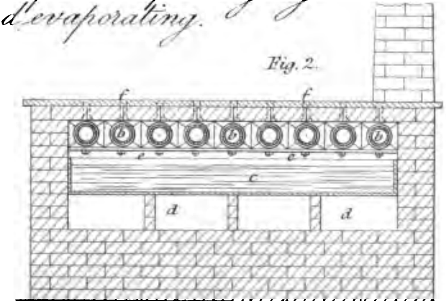
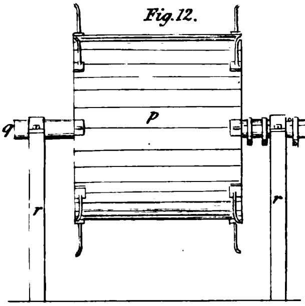


CONJOINED SERIES.

Heimann's impts in making wire-rope.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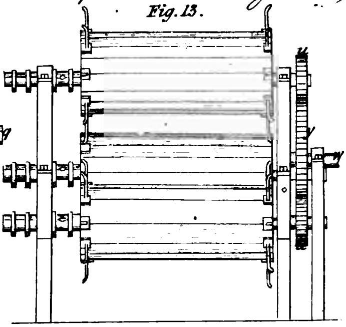
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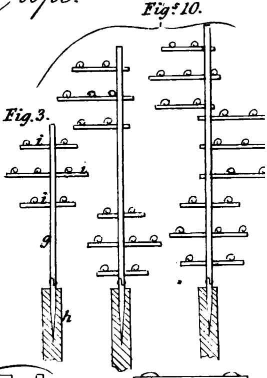
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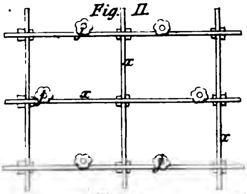
Figs 10.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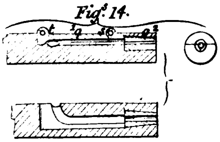
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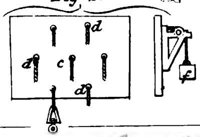
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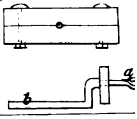

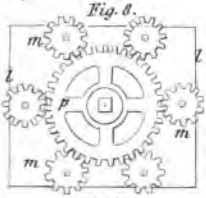
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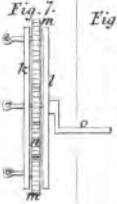
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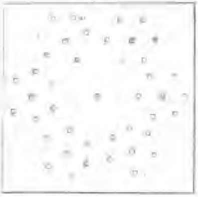
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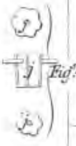
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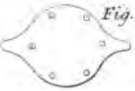
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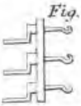
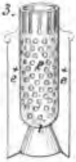


Fig. 5.

Wilson's impts in fire-places.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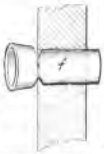
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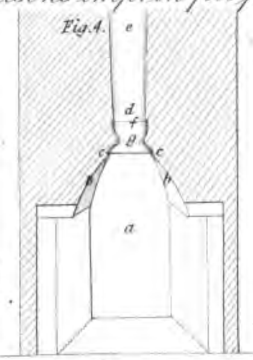
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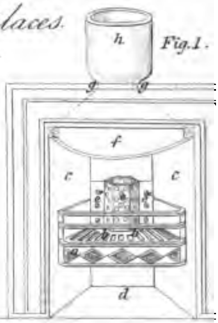
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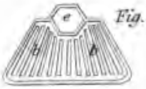
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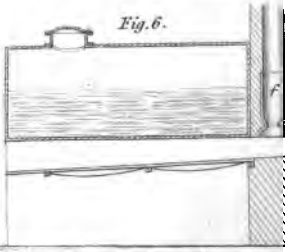
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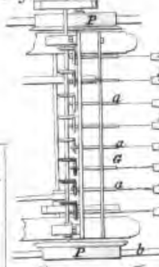
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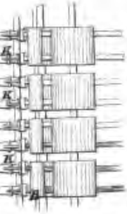
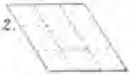


Fig. 2.

lson's mode of cutting envelopes.

Fig. 3.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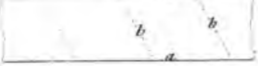
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Craig & Jarvie's impts in spinning hemp.

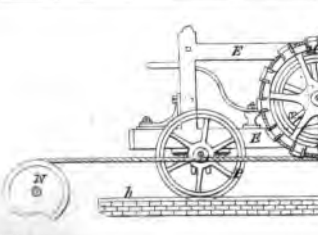
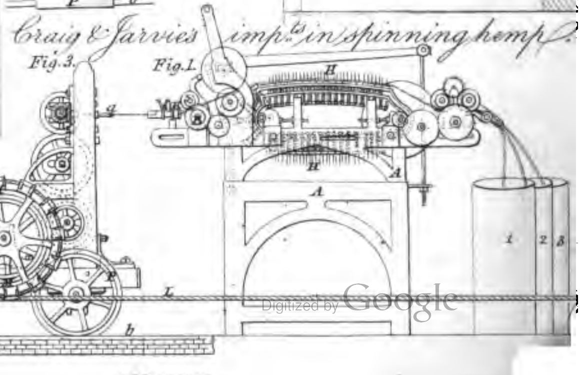
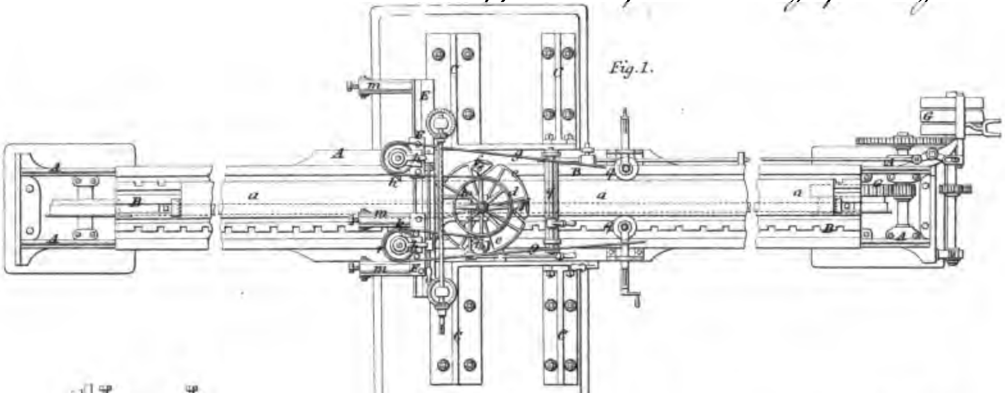



Fig. 3.
Fig. 1.

Sheppard's impts. in sawing & planing wood.



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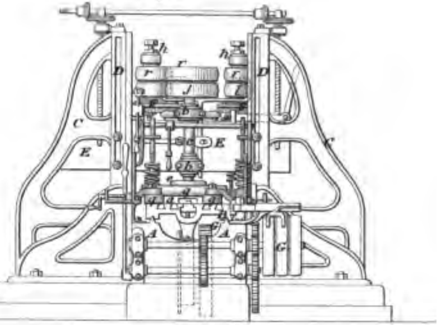

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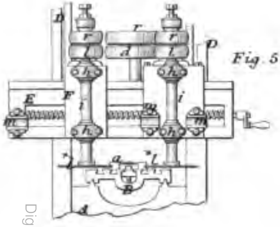

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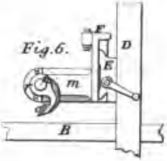

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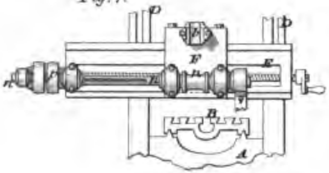

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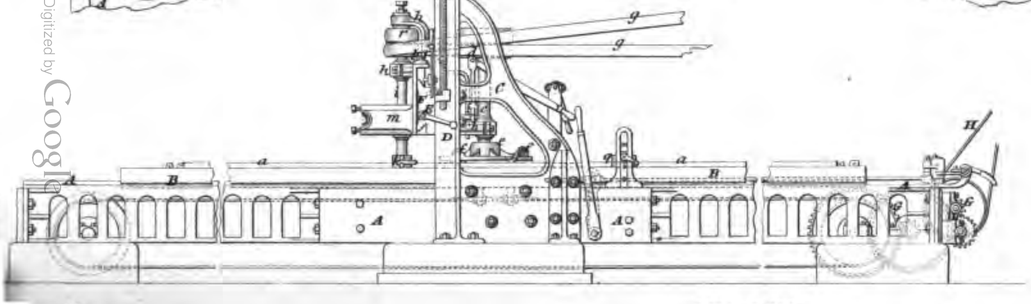

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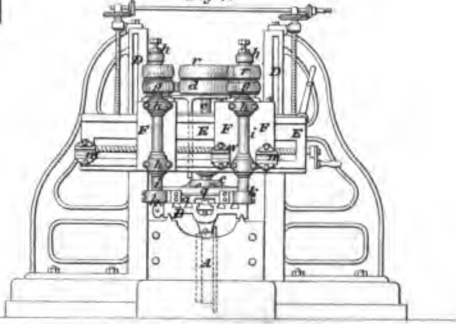
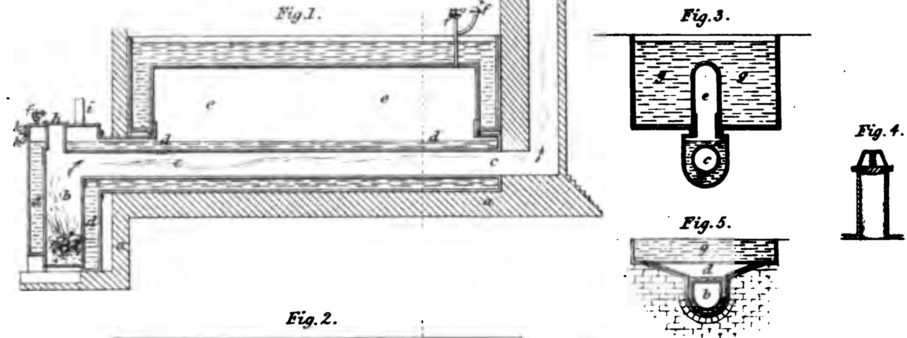


Fig 4.

Higham & Bellhouses imp.ts in evaporating.



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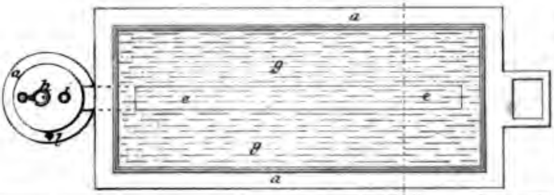
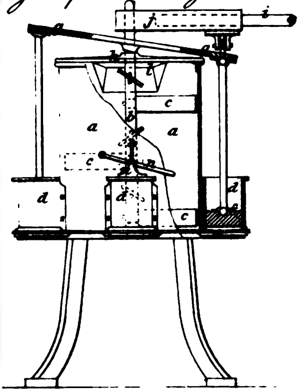
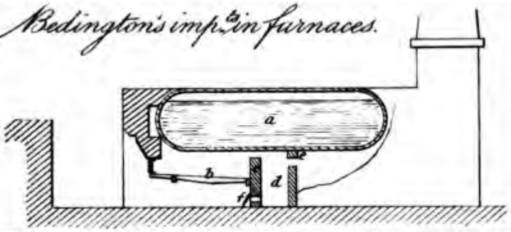


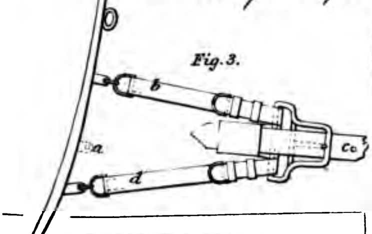
Worby's imp.ts in making bricks, &c.

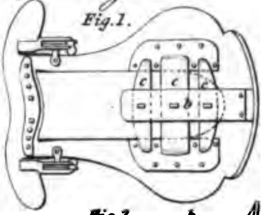


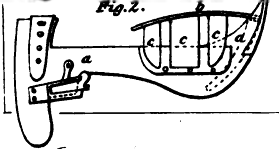
Bedington's imp.ts in furnaces.



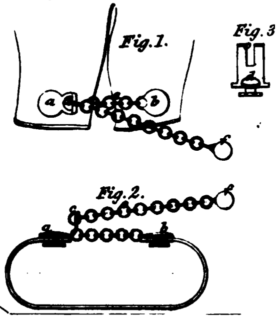
Bencraft's imp.ts in harness.



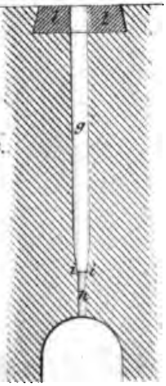


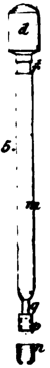


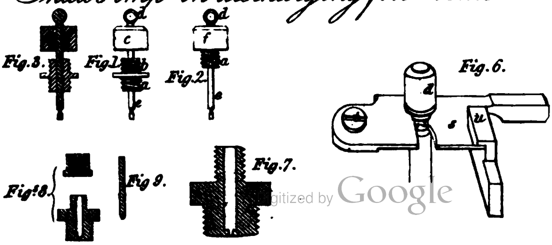
Petit's glove fastening.



Shaw's imp.ts in discharging fire-arms.



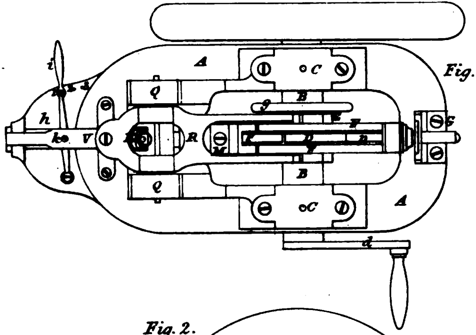




W. Newton del. 1st March 1845. J.

Harbottle's mach.y for rivetting shoe soles, &c.

Fig. 1.



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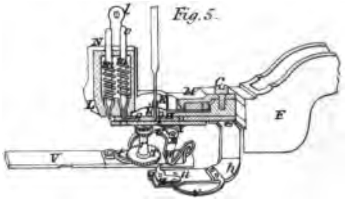

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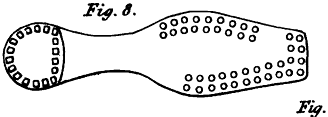

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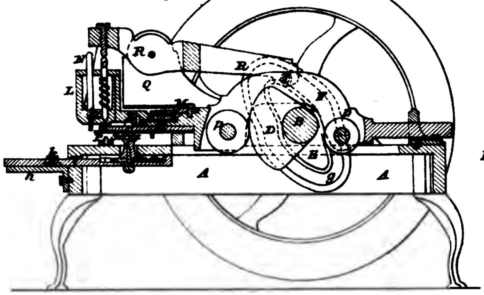

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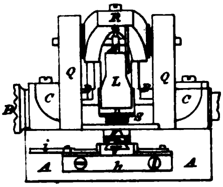

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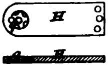

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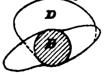

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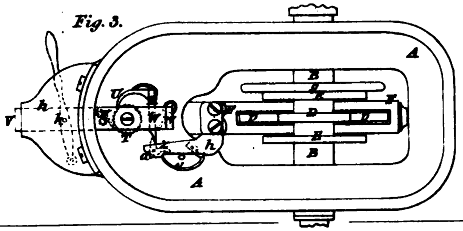
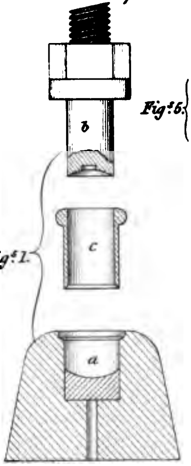


Elliot's imp.ts in making buttons.

Fig.s 1.



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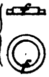

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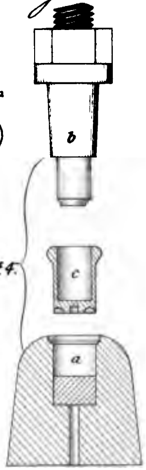

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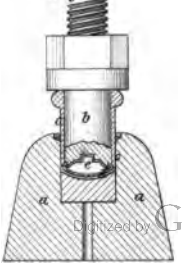
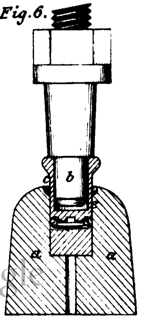


Fig. 6.



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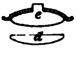
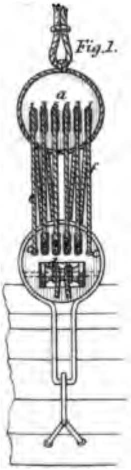


Chatten's imp.d dead eyes.

Fig. 1.



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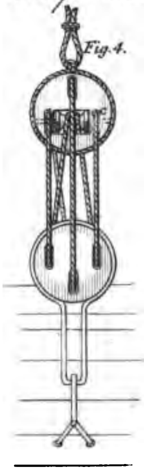

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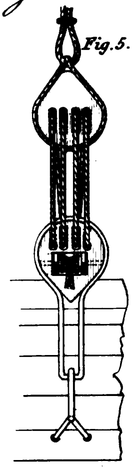

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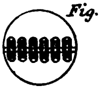

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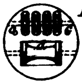
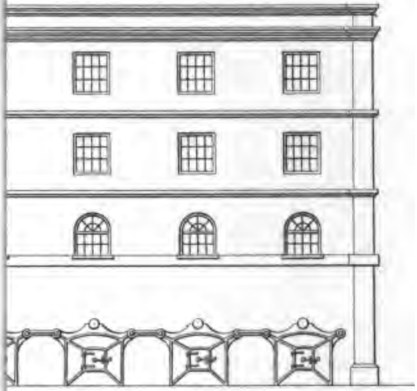
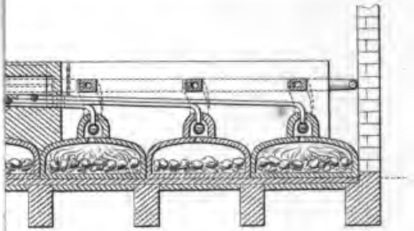
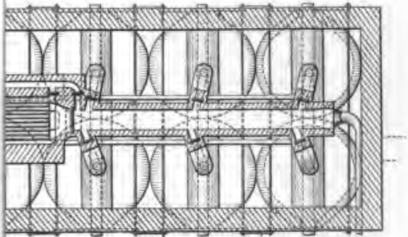


W. Newton del. 1st March 1845. T.S

PLATE VII.







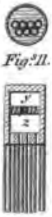
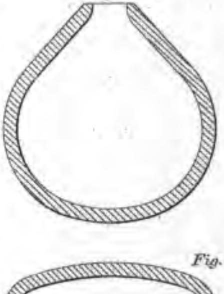


Fig.^{s}11.

Fig.10.



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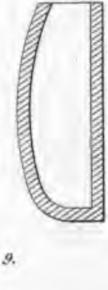

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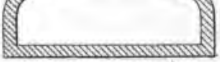

W.A.Beever sc.

Hays' impr.t mode of regulating the speed of propellers.—

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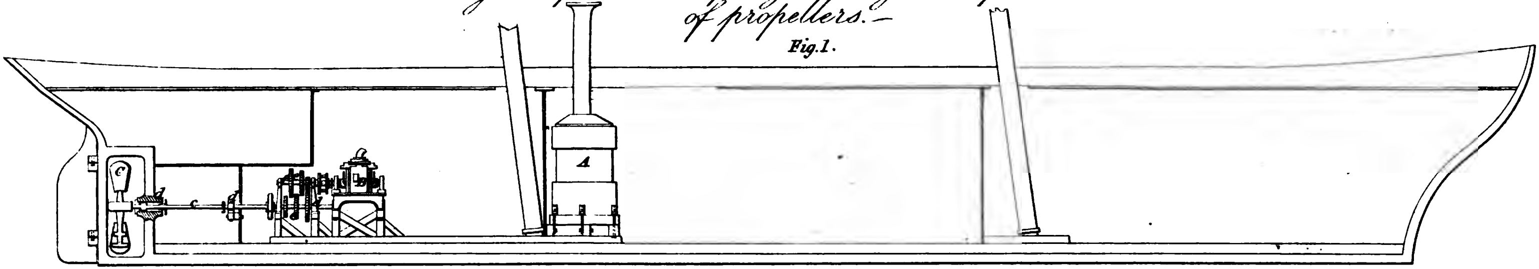

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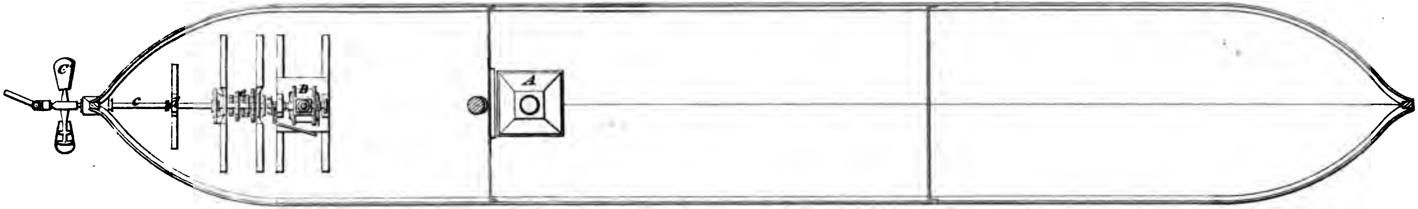

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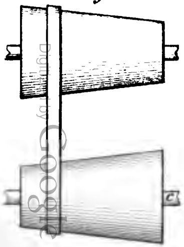

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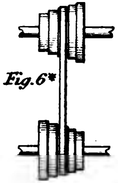

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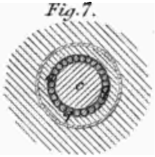

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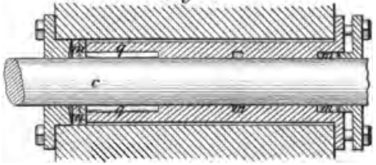

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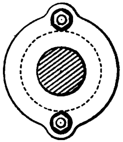

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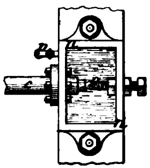

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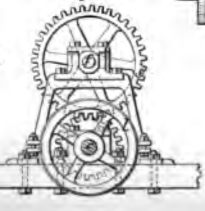

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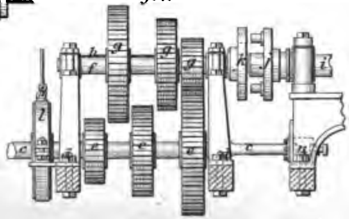
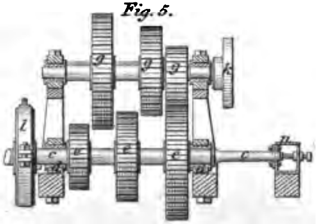


Fig. 5.



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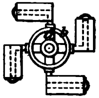

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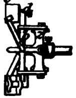

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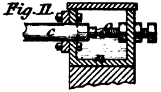
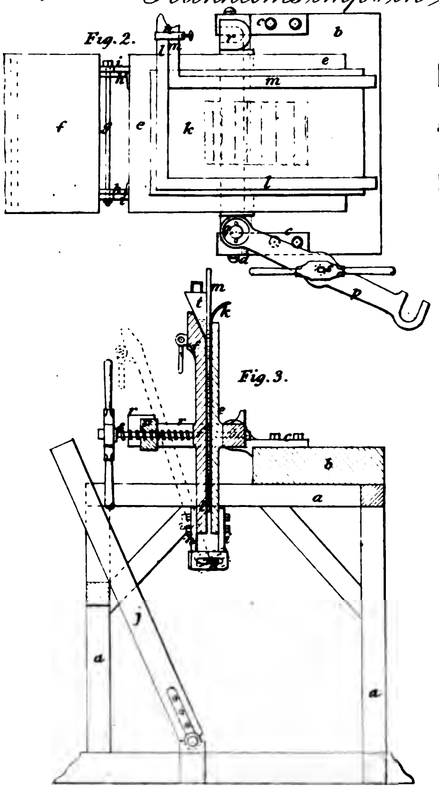
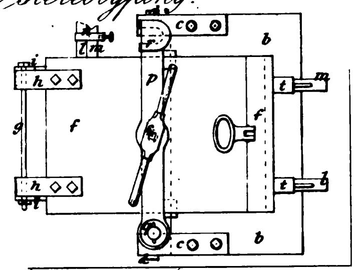


Kronheim's imp^ts. in stereotyping.

Fig. 2.





Heaton's imp^ts. in pumps.

Fig. 1.

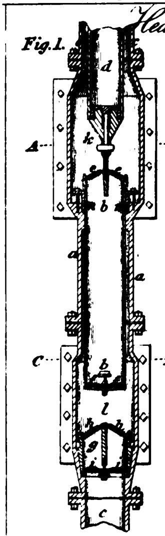
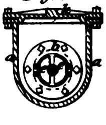


Fig. 3.



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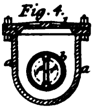

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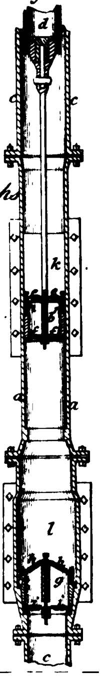
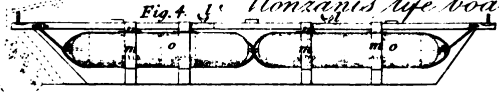


Monzani's life boat.

Fig. 4.



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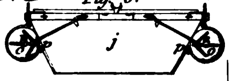

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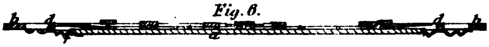

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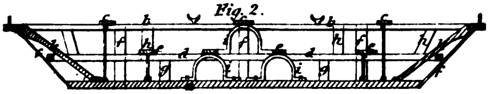

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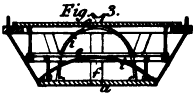

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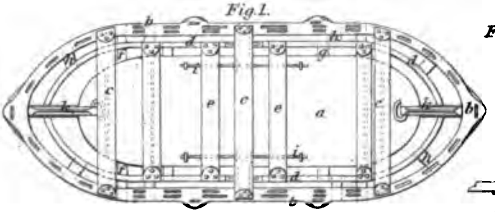

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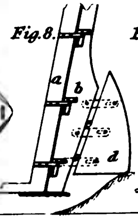

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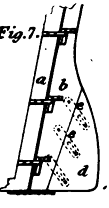
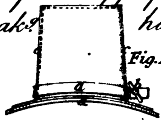


Simpson's app^ts. f… mak^g. h…

Fig.



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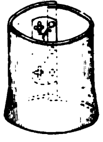

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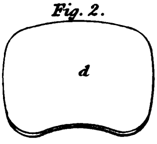

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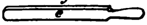
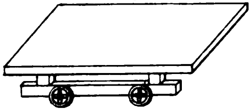


Ewing's imp^ts. in manufact^g. glass.

Fig. 3.



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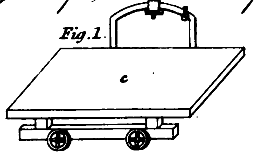

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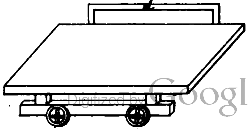

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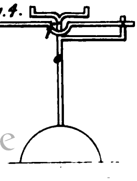


W. Newton del.

1st April 1845.

Irving's mach.y for carving wood

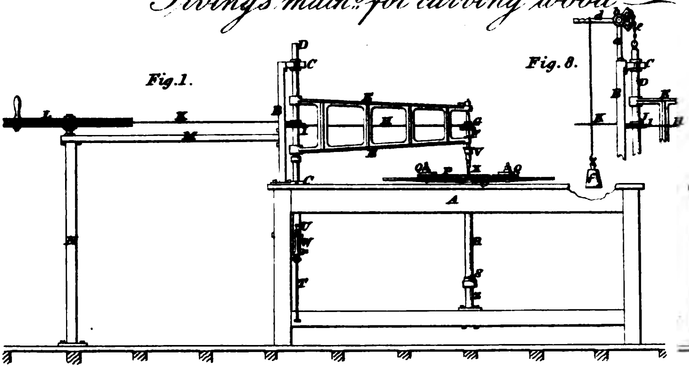
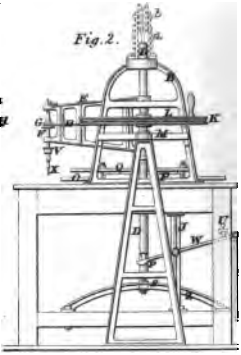


Fig.1.

Fig.8.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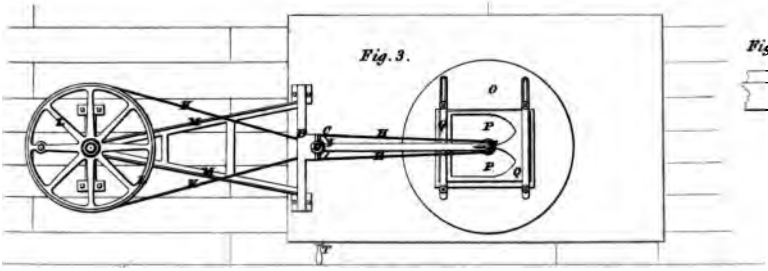
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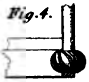


Fig.4.

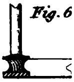
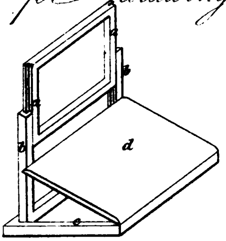


Fig.6

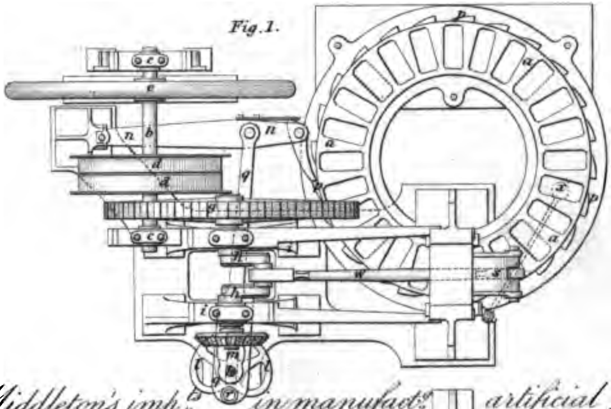
Fig 5.

Fig.7.

Lorimier's app.s for drawing



Middleton's imp.ts in manufact.g artificial fuel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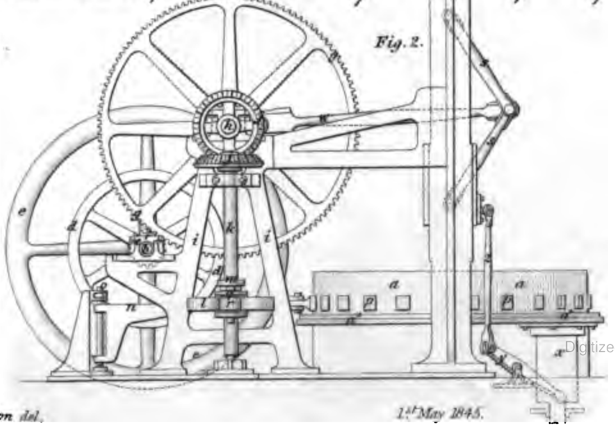
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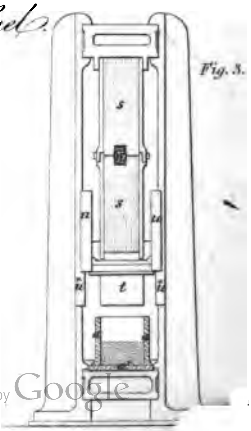


Fig.3.

Newton's app.ts for copying drawings.

Fig. 1.

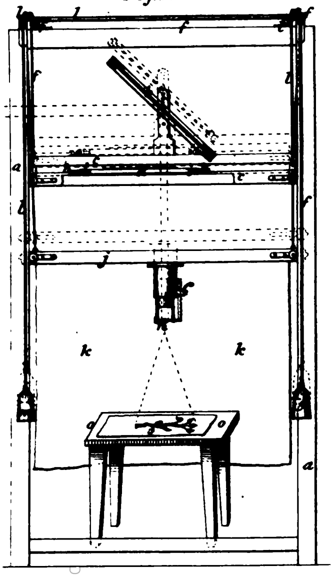
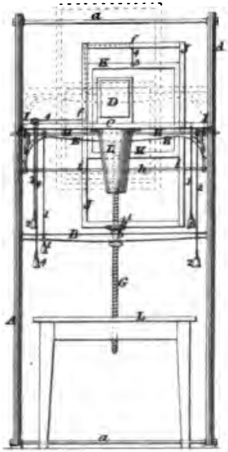


Fig. 2.



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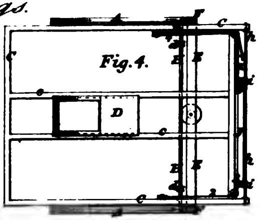
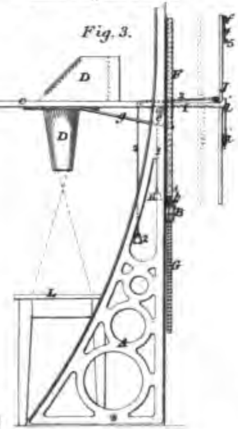
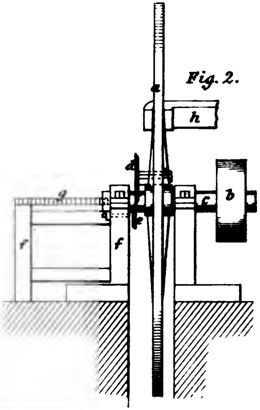


Fig. 3.



Carter's mach.y for cutting slate.

Fig. 2.



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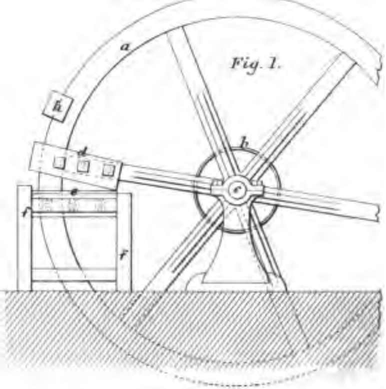
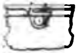


Clark's domestic convenience.



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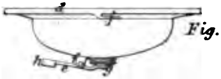

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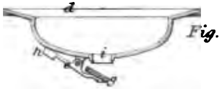
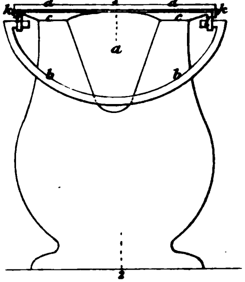


Fig. 4.

Fig. 1.



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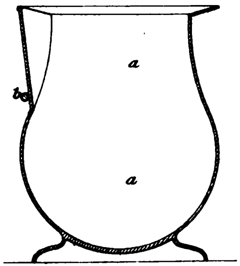


Turnbull's app.ts for tanning skins.

Fig. 1.

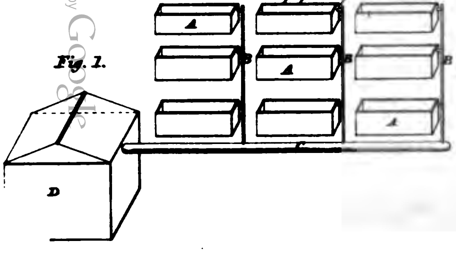
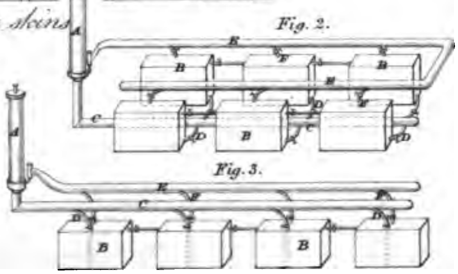


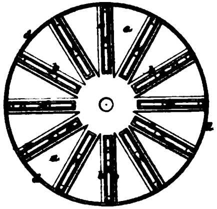
Fig. 2.

Fig. 3.



Newton's imp^{ts} in propelling.

Fig. 6.



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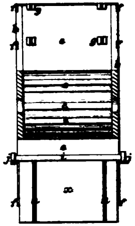

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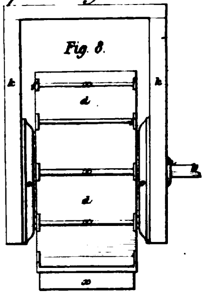

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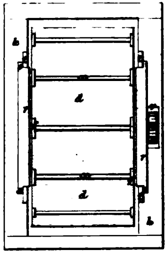

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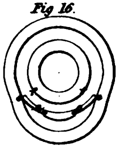

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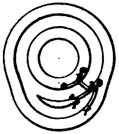

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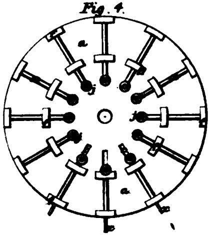

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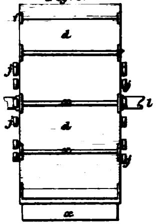

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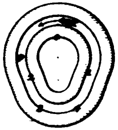

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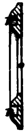

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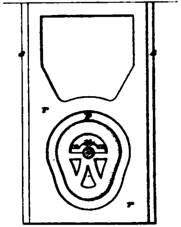

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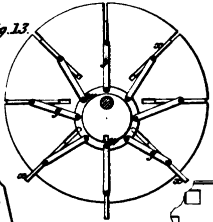

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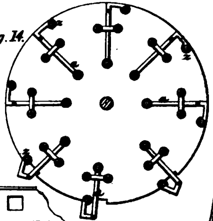
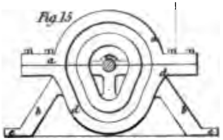


Fig. 15



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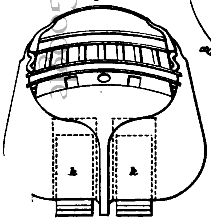

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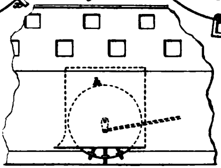

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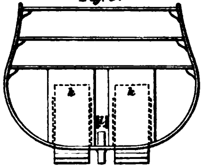

Insole's imp^{d} brushes.

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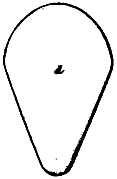
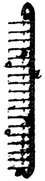


Fig. 2.



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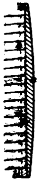

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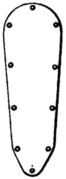

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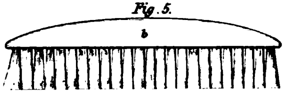

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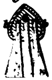

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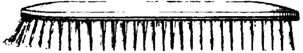

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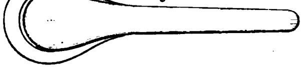
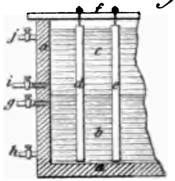
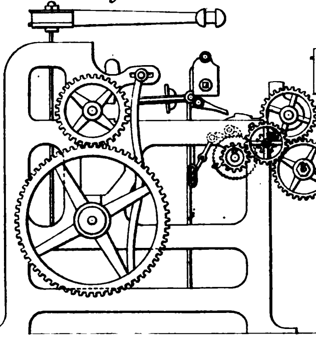


Ritchie's extracting copper.



Noton's imp^{ts} in looms.

Fig. 1.



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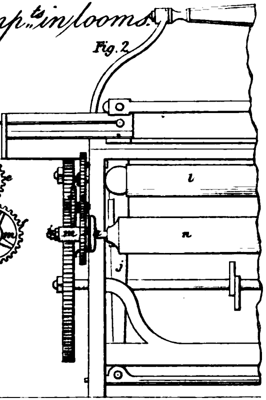


Cooper's imp.^{ts} in spinning.

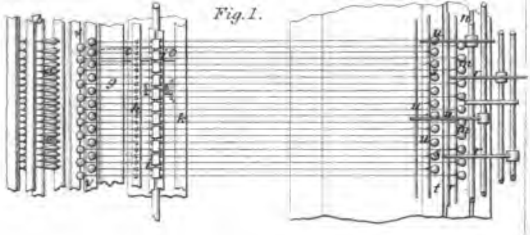


Fig. 1.

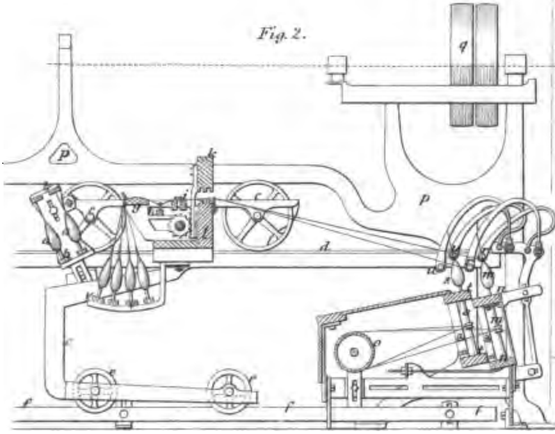
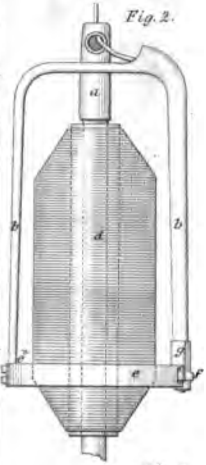


Fig. 2.

Groom's imp.^{d} flyer.



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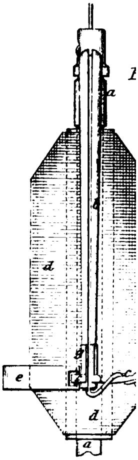

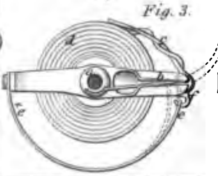

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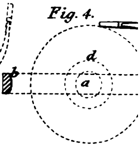
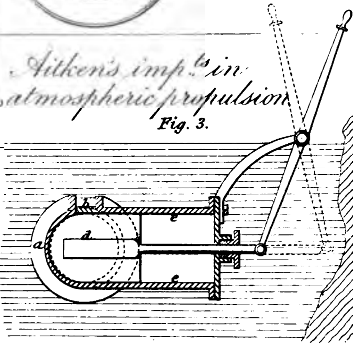


Fig. 4.

Aitken's imp.^{ts} in atmospheric propulsion.



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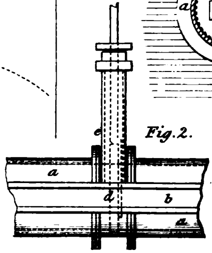

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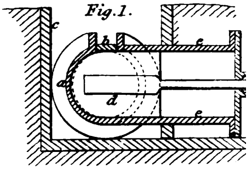


Fig. 1.

Newton's manufacture of zinc wire.

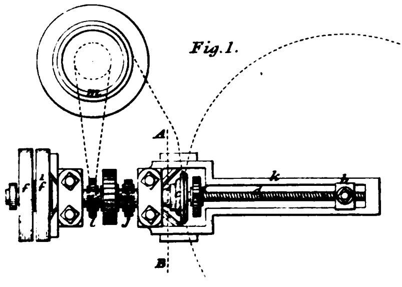
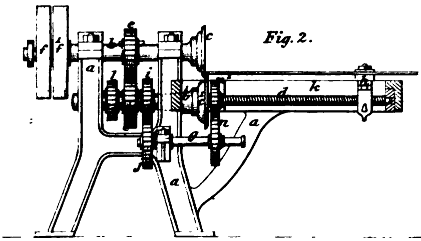


Fig. 1.



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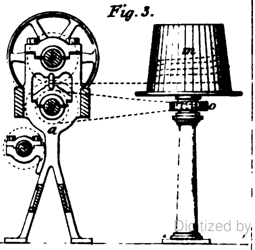
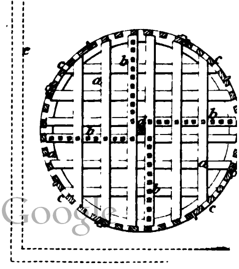
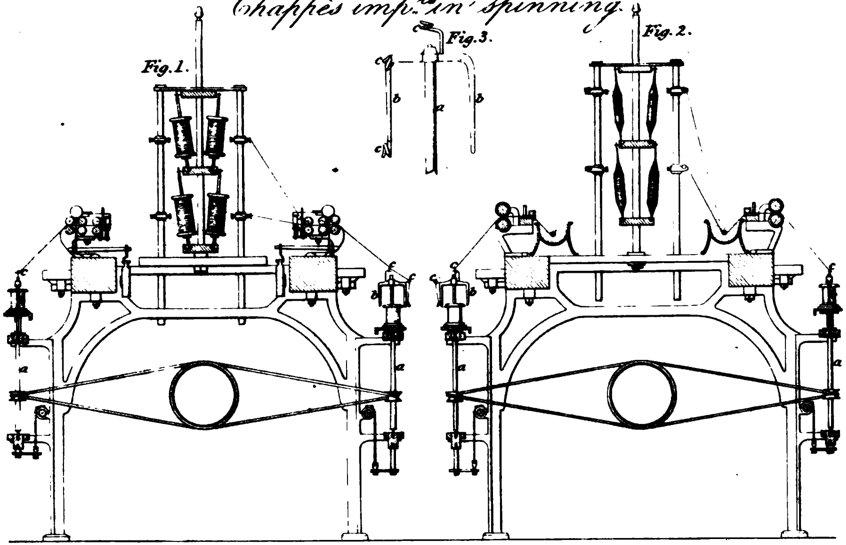


Fig. 3.

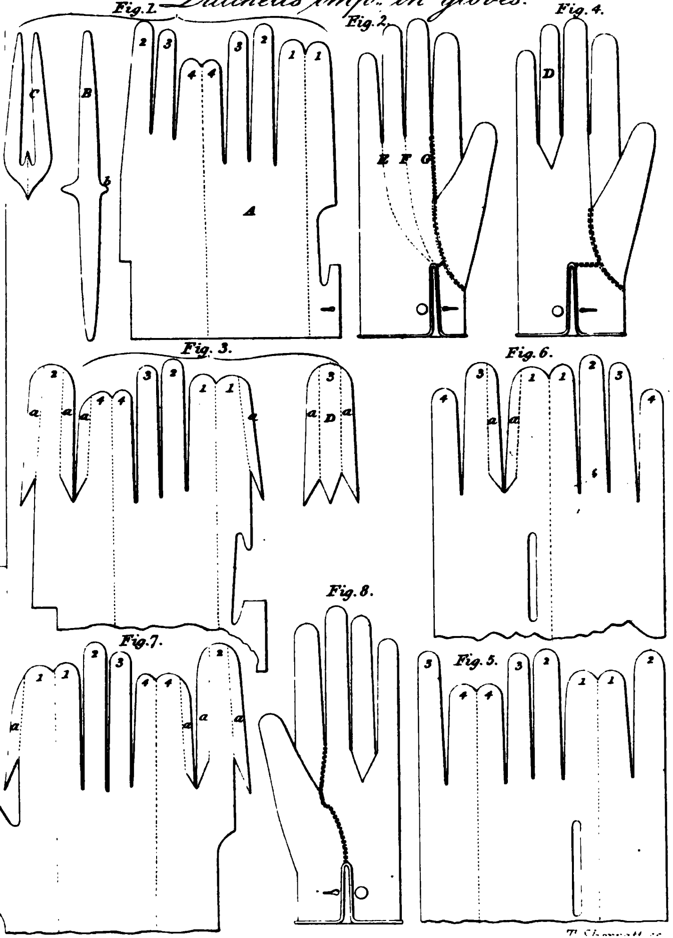
Squire's tanning



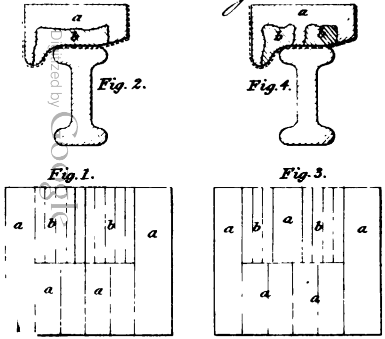
Chappé's imp.ts in spinning.



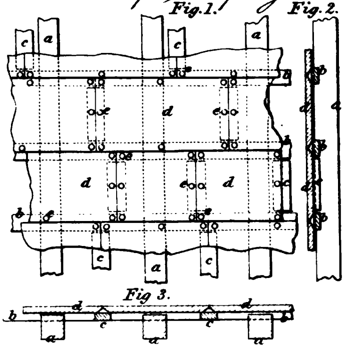
Pritchett's imp.ts in gloves.



Saunders' railway wheels.

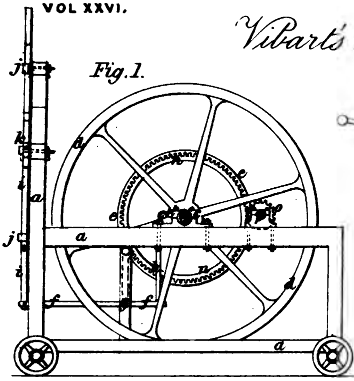


North's imp.d roofing.



Vibart's imp^{ts} in driving mach^{y}

Fig. 1.



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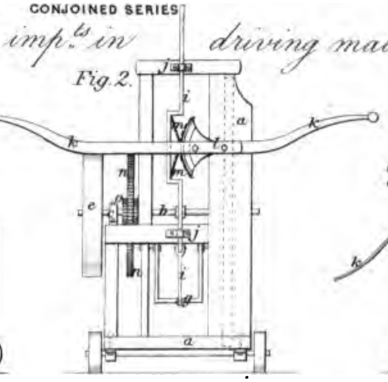

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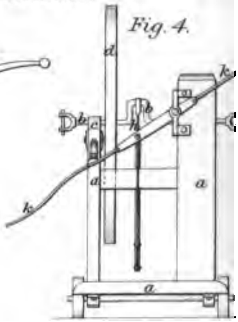

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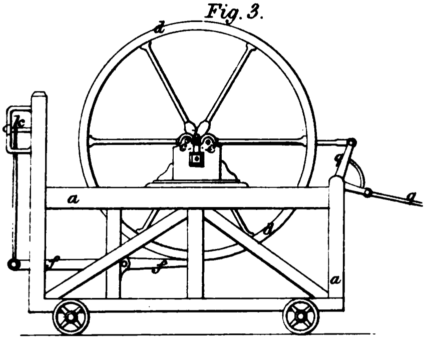


Fig. 5.

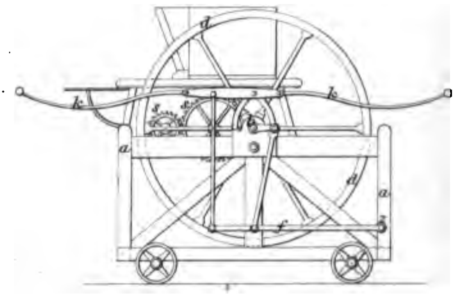


Fig. 7.

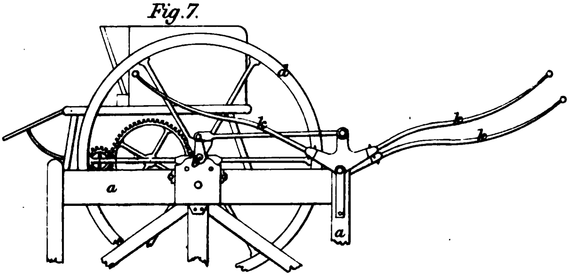
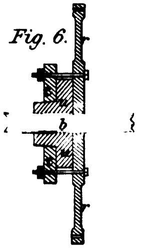


Fig. 6.



Atkinson's imp^{ts} in wheels.

Fig.^{s} 3.

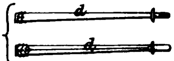
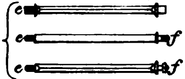


Fig.^{s} 4.



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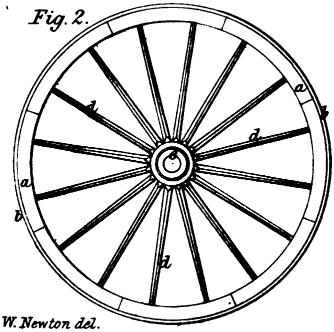

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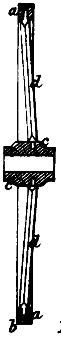

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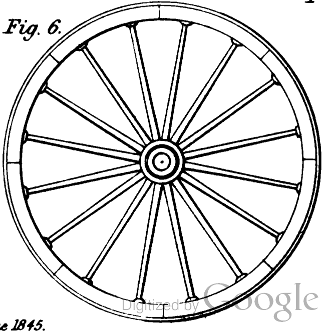

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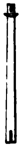


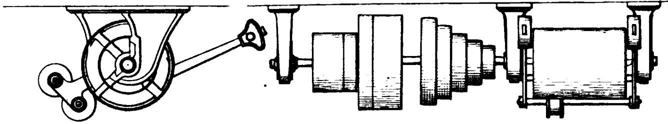
Fig.

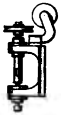
W. Newton del.

1st June 1845.

J. E. Wood

Fuller's imp.^d machinery for turning metals.





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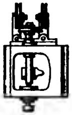

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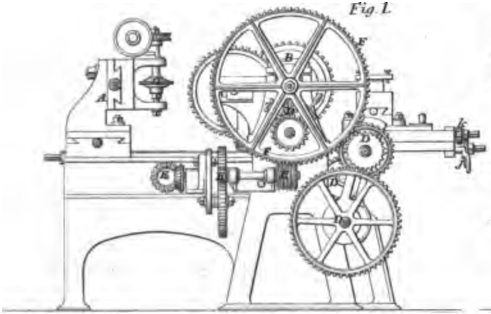

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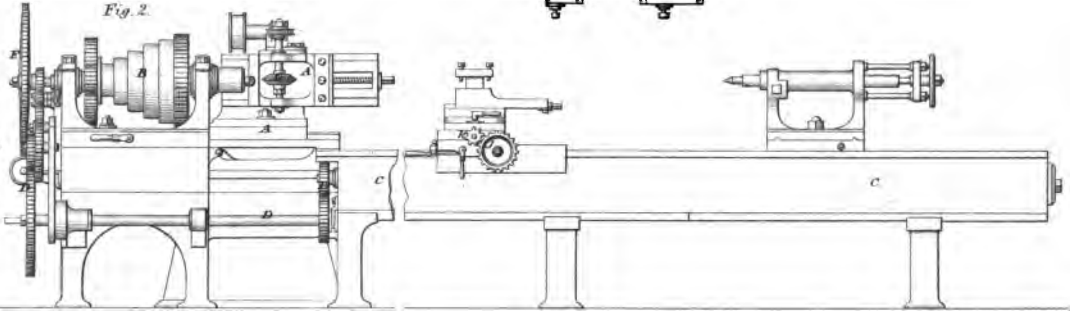

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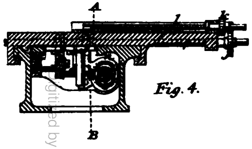

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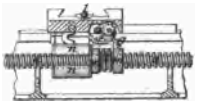

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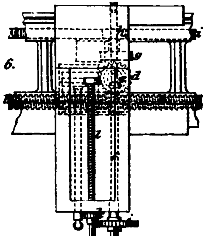

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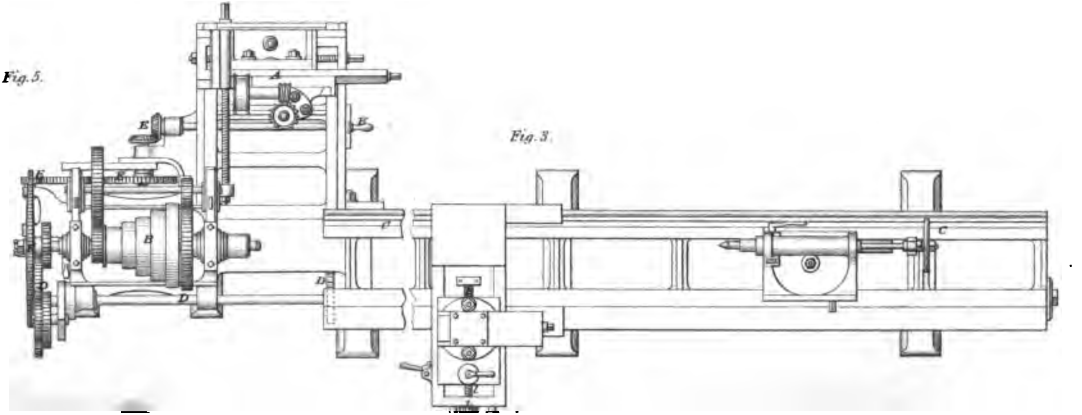
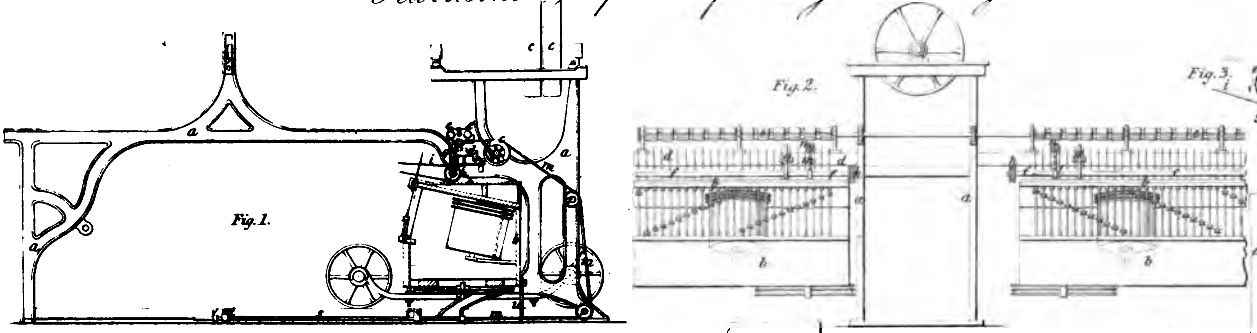
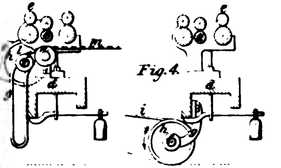


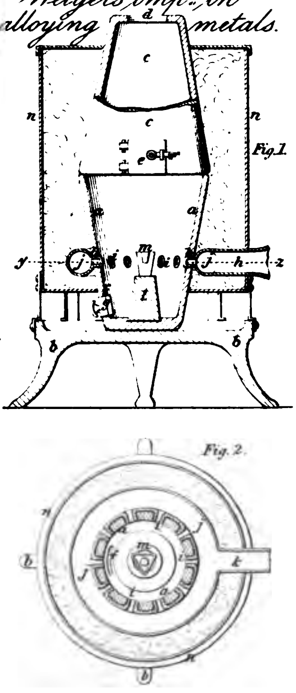
Fig. 3.

Harrison's imp.ts in spinning machinery. —

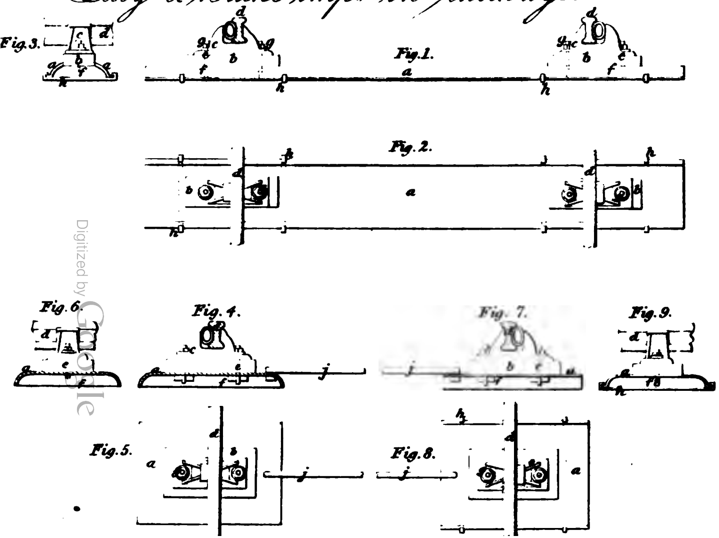




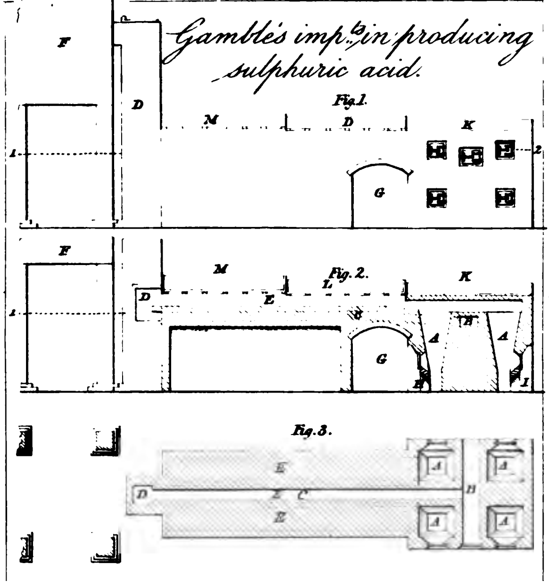
Weiger's imp.ts in alloying metals.



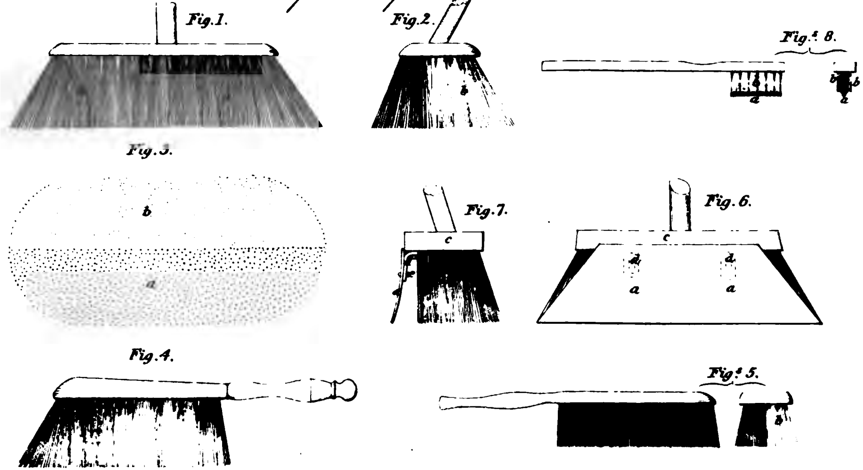
Lacy & Buck's imp.ts in railways.



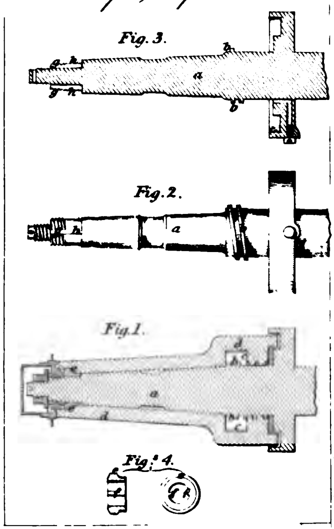
Gamble's imp.ts in producing sulphuric acid.



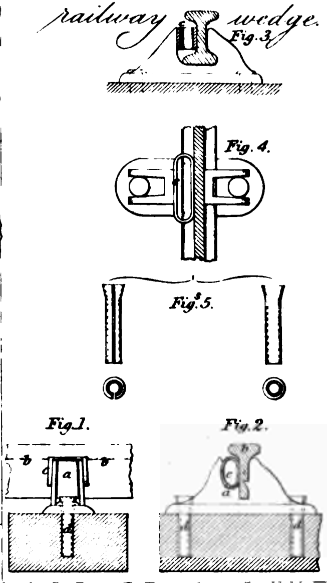
Metcalfe's improved brushes.



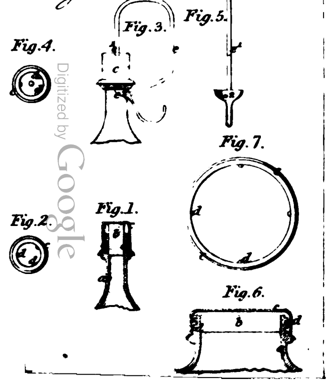
Millichap's impd. axletree.



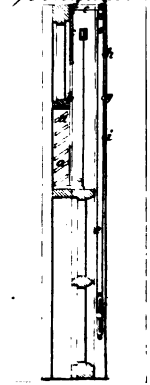
Barlow's railway wedge.



Leroy's cap for bottles.



Baillie's ventilator.



Spencer's impts. in corrugating iron.